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GLASS MANUFACTURE.

Hon. WILLIAM R. MERRIAM,
Director of the Census.

SIR: I transmit herewith, for publication in bulletin form, a report on glass manufacture, prepared under my direction by Mr. Shirley P. Austin, of Pittsburg, Pa., acting in the capacity of an expert special agent of the division of manufactures of the Census Office.

The statistics of glass manufacture were reported in 1880 and 1890 under four subdivisions, that is: Plate glass, window glass, glassware, and green and black glass. A separate schedule was prepared for each subdivision. In 1900 it was decided to assign the reports for the industry to two classes of products: Building glass, including plate glass, all varieties of cast and rolled sheet glass, and window glass; and pressed and blown ware and bottles and jars, including all pressed or blown flint glassware, and bottles and jars of flint, green, or amber glass.

The statistics seem to show a satisfactory rate of growth in the several branches of the industry, notwithstanding the fact that in nearly all lines the domestic manufacturers have been compelled to meet a vigorous foreign competition. The development of the industry has been marked by a noteworthy increase in the use of tank furnaces, and mechanical processes in lieu of hand work, which have resulted in an increased output combined with greater economy of operation. The distribution of the factories has depended to a considerable extent upon the supply of natural gas, the discovery of new fields being marked by an influx of glass factories from other localities having less favorable advantages in respect to fuel.

The statistics are presented in 14 tables: Table 1, comparative figures for the industry at the several censuses; Table 2, the statistics for idle establishments; Table 3, value of new construction; Tables 4 and 5, comparative statistics, by states, and by classes of products, respectively, 1880 to 1900; Table 6, rank of states according to value of products, with per cent of total value, 1880 to 1900; Tables 7 and 8, comparative statistics of the manufacture of building glass and the manufacture of pressed and blown glass and bottles and jars, respectively, by states, 1890 and 1900; Table 9, number of bottles manufactured, classified by capacity, by states; Table 10, imports and exports of glass; Table 11, comparative summary of materials used, 1890 and 1900; Tables 12, 13, and 14, presenting detailed statistics of the combined industry, the manufacture of building glass, and the manufacture of pressed and blown glass and bottles and jars, respectively.

In drafting the schedules of inquiry for the census of 1900, care was taken to preserve the basis of comparison with prior censuses. Comparison may be made safely with respect to all the general heads of the inquiry except those relating to capital, salaried officials, clerks, etc., and their salaries, the average number of employees, and the total amount of wages paid. Live capital, that is, cash on hand, bills receivable, unsettled ledger accounts, raw materials, stock in process of manufacture, finished products on hand, and other sundries, was first called for at the census of 1890. No definite attempt was made, prior to the census of 1890, to secure a return of live capital invested.

Changes were made in the inquiries relating to employees and wages, in order to eliminate defects found to exist on the form of inquiry adopted in 1890. At the census of 1890 the average number of persons employed during the entire year was called for, and also the average number employed at stated weekly rates of pay, and the average number was computed for the actual time the establishments were reported as being in operation. At the census of 1900 the greatest and least number of employees were reported, and also the average number employed during each month of the year. The average number of wage-earners (men, women, and children) employed during the entire year was ascertained by using 12, the number of calendar months, as a divisor into the total of the average numbers reported for each month. This difference in the method of ascertaining the average number of wage-earners during the entire year may have resulted in a variation in the number, and should be considered in making comparisons.

At the census of 1890 the number and salaries of proprietors and firm members actively engaged in the business or in supervision were reported, combined with clerks and other officials. In cases where proprietors and firm members were reported without salaries, the amount that would ordinarily be paid for similar services was estimated. At the census of 1900 only the number of proprietors and firm members actively engaged in the industry or in supervision was ascertained, and no salaries were reported for this class. It is therefore impossible to compare the number and salaries of salaried officials of any character for the two censuses.

Furthermore, the schedules for 1890 included in the wage-earning class overseers, foremen, and superintendents (not general superintendents or managers), while the census of 1900 separates from the wage-earning class such salaried employees as general superintendents, clerks, and salesmen. It is possible and probable that this change in the form of the question has resulted in eliminating from the wage-earners, as reported by the present census, many high-salaried employees included in that group for the census of 1890. With the exception of several other changes in the special features of the schedule, the investigation has been conducted along the lines followed at the census of 1890.

In some instances the number of proprietors and firm members, shown in the accompanying tables, falls short of the number of establishments reported. This is accounted for by the fact that no proprietors or firm members are reported for corporations. The reports show a capital of $61,423,903 invested in the 355 establishments reporting for the industry. This sum represents the value of land, buildings, machinery, tools, and implements, and the live capital utilized, but does not include the capital stock of any of the corporations. The value of the products is returned at $56,539,712, to produce which involved an outlay of $2,792,376 for salaries of officials, clerks, etc.; $27,084,710 for wages; $3,588,641 for miscellaneous expenses, including rent, taxes, etc.; and $16,731,009 for materials used, mill supplies, freight, and fuel. It is not to be assumed, however, that the difference between the aggregate of these sums and the value of the products, is, in any sense, indicative of the profits in the manufacture of the products during the census year. The census schedule takes no cognizance of the cost of selling manufactured articles, or of interest on capital invested, or of the mercantile losses incurred in the business, or of depreciation in plant. The value of the product given is the value as obtained or fixed at the factory. This statement is necessary in order to avoid erroneous conclusions from the figures presented.

Very respectfully,

S. N. D. North

Chief Statistician for Manufactures

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GLASS MANUFACTURE

By Shirley P. Austin, *Expert Special Agent.*

The manufacture of glass in this country dates almost from the arrival of the first English colonists in what is now the United States. One of the earliest attempts, if not the first, at manufacturing in the original thirteen colonies was directed toward the production of glass, and a glass works erected for that purpose in 1608 or 1609, and located about a mile from Jamestown, Va., was probably the first manufactory erected in America by the English colonists. In 1608 the London Company sent glassworkers to America to operate the plant, and in the following year some of the products constituted a part of the first cargo of goods exported from this country.[1] This first glass factory probably produced bottles exclusively. Its career was brief, as in 1617 it was reported fallen into decay, and later was swept entirely away in the Indian massacre of 1622. In 1620 a subscription list was started in Jamestown to erect a factory for the manufacture of glass beads, the currency among the Indians, and in 1621 the London Company sent Italian workmen for this plant, which seems to have been located some distance from Jamestown, as it escaped the massacre of 1622, and is referred to as late as 1623. In 1639 a glass factory was located at Salem, Mass., and previous to this, although the exact date is not known, glass was first made in New York on Manhattan Island.[2] The first mention of a glass factory in Pennsylvania is contained in a very vague reference in a letter written by William Penn in 1683. The progress of the industry during the colonial period was slow and financial reverses were the rule. The scarcity of glass during the Revolutionary War stimulated factory erection, and early in the Nineteenth century the industry assumed much prominence, being confined largely to Massachusetts, New York, eastern Pennsylvania, New Jersey, and Maryland. These early factories were usually situated within easy access to forests, from which the fuel supply was obtained. Not until the erection of the first factory west of the Allegheny Mountains, at Pittsburg in 1797, was coal used as a fuel in glass manufacture, and it was many years before it came into general use.[3] The Atlantic seaboard long held supremacy in the manufacture of glass, but with the westward spread of population and the discovery of rich fuel resources in western Pennsylvania, West Virginia, Ohio, and Indiana, the center of the industry has steadily moved westward and the bulk of the production has been for some time west of the Alleghenies.

This report, with the statistical tables accompanying it, includes only establishments manufacturing glass from the crude material and does not include the large number of separate establishments engaged in the reworking of glass, such as silvering, beveling, cutting, engraving, decorating, etc. A number of the glass establishments, however, carry on these processes in direct connection with the manufacture of the "metal" in the same factory, and such establishments are included.

The inquiry into glass manufacture for this census was based on the following classification of the industry: (1) Building glass, all establishments making common window glass, plate glass, and all varieties of cast and rolled sheet glass; (2) pressed and blown glass, all establishments manufacturing pressed or blown flint glassware, tableware, jellies, tumblers, goblets, lamps, chimneys, lantern globes, gas and electric lighting ware, stem ware, opal ware, cut glass, etc.; (3) bottles and jars, all establishments manufacturing bottles and jars in flint, green, or amber glass. It has been found necessary to combine the last two divisions, as several firms reported production in both these branches.

Table 1 is a comparative summary of the statistics for the industry as returned at the censuses of 1850 to 1900, inclusive, with the percentages of increase for each decade.

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[1] Stith's History of Virginia, pages 77 and 82.

[2] Bishop's History of American Manufactures, Vol. I, pages 233 and 234.

[3] History of Pittsburg, by Neville B. Craig, 1851, pages 276 and 277.

Table 1.—COMPARATIVE SUMMARY, 1850 TO 1900, WITH PER CENT OF INCREASE FOR EACH DECADE.

	DATE OF CENSUS.						PER CENT OF INCREASE.				
	1900	1890	1880	1870	1860	1850	1890 to 1900	1880 to 1890	1870 to 1880	1860 to 1870	1850 to 1860
Number of establishments	355	294	169	201	112	94	20.7	74.0	[1]15.9	79.5	19.1
Capital	$61,423,903	$40,966,850	$18,804,599	$14,111,642	$6,133,666	$3,402,350	49.9	117.9	33.3	130.1	80.3
Salaried officials, clerks, etc., number	2,268	[2]1,095	(3)	(3)	(3)	(3)	107.1	......	......	......	......
Salaries	$2,792,376	[2]$1,232,561	(3)	(3)	(3)	(3)	126.6	......	......	......	......
Wage-earners, average number	52,818	44,892	24,177	15,822	9,016	5,668	17.7	85.7	52.8	75.5	59.1
Total wages	$27,084,710	$20,885,961	$9,144,100	$7,846,425	$2,903,832	$2,094,576	29.7	128.4	16.5	170.2	38.6
Men, 16 years and over	42,173	36,064	17,778	11,505	8,765	5,571	16.9	102.9	54.5	31.3	57.3
Wages	$24,901,233	$19,546,351	(3)	(3)	(3)	(3)	27.4	......	......	......	......
Women, 16 years and over	3,529	1,885	741	715	251	97	87.2	154.4	3.6	184.9	158.8
Wages	$840,001	$332,245	(3)	(3)	(3)	(3)	152.8	......	......	......	......
Children, under 16 years	7,116	6,943	5,658	3,602	(3)	(3)	2.5	22.7	57.1	......	......
Wages	$1,343,476	$1,007,365	(3)	(3)	(3)	(3)	33.4	......	......	......	......
Miscellaneous expenses	$3,588,641	$2,267,696	(4)	(4)	(4)	(4)	58.3	......	......	......	......
Cost of materials used	$16,731,009	$12,140,985	$8,028,621	$6,133,168	$2,914,303	$1,556,833	37.8	51.2	30.9	110.5	87.2
Value of products	$56,539,712	$41,051,004	$21,154,571	$19,235,862	$8,775,155	$4,641,676	37.7	94.1	10.0	119.2	89.1

[1] Decrease. [2] Includes proprietors and firm members, with their salaries; number only reported in 1900, but not included in this table. (See Table 12.)
[3] Not reported separately. [4] Not reported.

The remarkable growth of the glass making industry in the last half century is shown in Table 1. With the exception of a decrease in the number of establishments between 1870 and 1880, the table shows a steady increase in every item from 1850 to 1900. From 1850 to 1900 the number of establishments increased 261, or 277.7 per cent. The great improvement in factory construction and equipment and the broadening of the scope of the business during the same period are indicated by the increase in capital from $3,402,350 in 1850 to $61,423,903 in 1900, or 1,705.3 per cent. The number of wage-earners has increased from 5,668 in 1850 to 52,818 in 1900, or 831.9 per cent; and wages paid, from $2,094,576 in 1850 to $27,084,710 in 1900, or 1,193.1 per cent. During the same period the cost of materials used has increased from $1,556,833 to $16,731,009, or 974.7 per cent; and the value of products, from $4,641,676 to $56,539,712, or 1,118.1 per cent.

The growth from 1890 to 1900 was vigorous, as shown by an increase of 20.7 per cent in number of active establishments, and of 49.9 per cent in capital invested. The increase in capital was largely caused by the general introduction during the decade of the tank melting furnace, which necessitates much more costly and permanent factory construction and equipment than the pot furnace, which it is fast supplanting.

Of the total cost of materials used in 1900, $16,731,009, the principal item was the cost of packages and package materials, which was $3,390,627, and in 1890 was $1,853,462, an increase of $1,537,165, or 82.9 per cent. This large increase was caused in part by the demand for a neater package for finished products in nearly all lines of glass manufacture, created by increased competition, and by the more general use of the carton package for lamp chimneys, shades, globes, and the great variety of high-grade glassware, and the increased use of paper between sheets in packing building glass. In addition to the above package materials, establishments manufacturing pressed and blown ware, bottles, and jars reported in 1900, $1,522,917 as the cost of caps, metal trimmings, and rubber supplies. The cost of these materials was not reported separately at the census of 1890, but there has been an enormous increase in their consumption.

The total cost of fuel in 1900 was reported as $3,203,146. Of this amount, natural gas cost $1,575,278; coal, $1,074,074; and oil, $409,158; the remainder being divided between coke and wood. A number of establishments, particularly in Indiana, reported little or no cost for fuel, as they were either getting "free gas" as an inducement for location, or owned the source of their supply, and reported the small cost of maintenance under the item of general expense. Hence there was a large amount of natural gas used as fuel which was not reported.

Soda ash is the third largest item of cost in materials used, 157,779 tons being reported, at a cost of $2,259,939. In 1890, 96,777 tons were reported, costing $3,108,233. The average cost per ton in 1900 was $14.32, and in 1890, $32.12. While the quantity of soda ash used in glass manufacture during the decade increased 63 per cent, the cost decreased 27.3 per cent. The comparison shows the benefits derived by the glass industry from the development of the American soda-ash manufacture in the last ten years, a development that received the greater share of its impetus from men actively connected with the glass industry.

The increase in the value of products between 1890 and 1900 was 37.7 per cent, but it is safe to say the increase in the quantity of products was in excess of that, especially in the output of bottles, jars, and glassware, owing to the general introduction of the tank melting furnace and the adoption of improved mechanical equipment. The number of pieces of glassware, bottles, jars, etc., manufactured, was not reported at the census of 1890. It is therefore impossible to make a comparison with such data at the present census. The total production of plate glass, rough and polished, in 1890, was 12,206,942 square feet; and in 1900, 17,512,262 square feet, an increase of 43.5 per cent. There were 2,773,824 square feet of cathedral glass manufactured in 1890, and 8,846,361 square feet in 1900, or an increase of 218.9 per cent. The quantities of skylight and wire glass manufactured in 1900 were 3,679,694, and 1,295,504 square feet, respectively. No report was made of these products at the census of 1890. In 1890 there were 3,768,884 boxes of window glass manufactured, and 4,341,282 boxes in 1900, an increase of only 15.2 per cent. The comparatively small increase is explained by the much shorter "run" of factories during the "fire" covered by the present census, the average "run" being about six months in 1900 and nearly ten months in 1890. In addition, a large percentage of the available capacity of the factories was idle in 1900 for want of workmen.

Table 2 shows the idle establishments, by states, with the capital invested and the equipment of the factories, for 1900.

TABLE 2.—IDLE ESTABLISHMENTS, BY STATES: 1900.

	United States.	Illinois.	Indiana.	Kentucky.	New Jersey.	New York.	Ohio.	Pennsylvania.	Washington.	West Virginia.
Number of establishments	60	6	7	2	8	4	8	19	1	5
Capital	$3,544,536	$258,000	$121,035	$70,581	$84,700	$337,900	$308,018	$1,968,582	$60,000	$335,720
Equipment and character of works:										
Furnaces, number	41	8			6		8	13		6
Pots, number	488	140			42		87	156		63
Tanks—										
Continuous, number	27	1	6		3	4	2	10		1
Rings, number	248	6	46		29	52	15	90		10
Pot capacity, number	592	18	92		82	132	30	218		20
Intermittent or day, number	16		3	3	1		2	4	1	2
Pot capacity, number	139		41	18	36		4	18	10	12
Flattening ovens, number	38	2			11	10		14		1
Monkey ovens, number	32						30	2		
Blow furnaces, number	20				2	4		12		2
Casting tables, number	6	3						3		
Annealing ovens, number	67	4	12	29	4			16		2
Bending ovens, number	3							2		1
Clay grinding mills, number	2							2		
Grinding machines, number	13				3		5	5		
Polishing machines, number	3				2			1		
Shops, number	167	15	51	11	5	26	16	43		
Glory holes, number	118	8	16	6	1	4	22	55		6
Lehrs, number	153	8	14		12	20	29	47		23
Decorating kilns, number	11						1			10
Decorating lehrs, number	2						1	1		
Hand presses, number	56			5			3	29		19
Mechanical presses, number	12							7		5
Blowing machines, number	10					10				
Finishing machines, number	15							13		2
Crimping machines, number	16						10	6		
Sand-blast machines, number	3						1			2
Grinding machines for fruit-jar tops, number	4		1					3		

In addition to the 355 active establishments reported in 1900, Table 2 shows that 60 establishments, with a capital of $3,544,536, were reported as idle during the census year. These establishments were located as follows, by states: Illinois, 6; Indiana, 7; Kentucky, 2; New Jersey, 8; New York, 4; Ohio, 8; Pennsylvania, 19; Washington, 1; West Virginia, 5. Only those idle establishments that seemed reasonably certain of being again put in operation in the near future are included in Table 2. No account was taken of the many dismantled and abandoned glass factories in the country.

Of the 60 idle establishments reported, 41, with a capital of $2,296,587, were for the manufacture of pressed and blown ware or bottles and jars. The equipment of these establishments was as follows: 22 furnaces of 257 pots; 19 continuous tanks of 152 rings, or 304 pots capacity; 11 intermittent or day tanks of 120 pots capacity; 118 glory holes; 61 annealing ovens; 117 lehrs: 11 decorating kilns; 2 decorating lehrs; 56 hand presses; 12 mechanical presses; 10 blowing machines; 15 finishing machines; 16 crimping machines; 3 sand-blast machines; and 4 machines for grinding fruit jar tops. The remaining 19 idle establishments were building-glass factories, which reported a total capital of $1,247,949, and the following equipment: 19 furnaces of 231 pots; 8 continuous tanks of 96 rings or 288 pots capacity; 5 day tanks of 19 pots capacity; 38 flattening ovens; 32 monkey ovens; 20 blow furnaces; 6 casting tables; 6 annealing ovens; 3 bending ovens; 36 lehrs; 13 grinding machines; 3 polishing machines; and 2 clay grinding mills.

In addition to the establishments that were idle throughout the census year, a certain portion of the furnace equipment of active establishments was reported as idle. In active building glass factories, 29 pot furnaces with 471 pots, and one intermittent or day tank furnace of 7 pots capacity were reported as idle. In active pressed and blown ware and bottle and jar factories, 31 pot furnaces with 336 pots, 14 continuous tank furnaces with 79 rings of 158 pots capacity, and 16 intermittent or day tank furnaces of 76 pots capacity were reported as idle. The entire idle furnace equipment of active establishments in both branches of glass manufacture was as follows: 60 pot furnaces with 807 pots, 14 continuous tank furnaces with 79 rings of 158 pots capacity, and 17 intermittent or day tank furnaces of 83 pots capacity. It should be stated in this connection that this idle equipment is included in all tables presenting such data in this report, except Table 2. Adding the statistics of active establishments to those shown in Table 2 gives a total of 415 active and idle establishments in the United States, with a capital of

$64,968,439. The combined equipment of all establishments is as follows: Furnaces, 492; pots, 5,595; continuous tanks, 233; pot capacity of continuous tanks, 4,525; intermittent or day tanks, 163; pot capacity of intermittent or day tanks, 1,040; flattening ovens, 323; monkey ovens, 34; blow furnaces, 279; casting tables, 106; annealing ovens, 936; bending ovens, 12; clay grinding mills, 73; grinding machines, 240; polishing machines, 297; shops, 4,145; glory holes, 1,537; lehrs, 1,480; decorating kilns, 116; decorating lehrs, 25; hand presses, 971; mechanical presses, 61; blowing machines, 179; finishing machines, 155; crimping machines, 510; mechanical polishers, 16; sand-blast machines, 76; grinding machines for fruit jar tops, 141.

Table 3 presents the value of new construction, by states, during the census year. Only the value of additions to existing factories is given in the table, not including ordinary repairs and the value of new plants constructed.

TABLE 3.—NEW CONSTRUCTION, BY STATES: 1900.

STATES.	Cost of new construction (additions to old works, not including ordinary repairs) during census year.
United States	$578,917
Georgia	2,500
Illinois	43,448
Indiana	186,004
Michigan	4,848
New Jersey	22,664
New York	37,429
Ohio	26,141
Pennsylvania	184,682
West Virginia	12,201
Wisconsin	69,000

Table 4 presents comparative statistics of glass manufacture, by states, for the years 1880, 1890, and 1900.

TABLE 4.—COMPARATIVE STATISTICS, BY STATES: 1880 TO 1900.

STATES.	Year.	Number of establishments.	Capital.	SALARIED OFFICIALS, CLERKS, ETC.		AVERAGE NUMBER OF WAGE-EARNERS AND TOTAL WAGES.							
						Total.		Men, 16 years and over.		Women, 16 years and over.		Children, under 16 years.	
				Number.	Salaries.	Average number.	Wages.	Average number.	Wages.	Average number.	Wages.	Average number.	Wages.
United States	1900	355	$61,423,903	2,268	$2,792,376	52,818	$27,084,710	42,173	$24,901,233	3,529	$840,001	7,116	$1,343,476
	1890	294	40,966,850	[1]1,095	[1]1,232,561	44,892	20,885,961	36,064	19,546,351	1,885	332,245	6,943	1,007,365
	1880	[2]194	[2]19,329,699	(3)	(3)	24,177	9,144,100	17,778	(3)	741	(3)	5,658	(3)
Illinois	1900	6	2,181,801	75	110,100	3,304	1,621,286	2,607	1,496,891	148	28,456	549	95,939
	1890	13	1,721,878	31	44,710	2,762	1,188,051	2,215	1,121,526	20	3,860	527	62,665
	1880	6	425,000	(3)	(3)	732	342,027	632	(3)	....	(3)	100	(3)
Indiana	1900	110	12,775,389	509	649,227	13,015	7,226,047	10,910	6,808,042	634	129,808	1,471	288,197
	1890	21	3,556,563	79	75,682	3,010	1,469,149	2,633	1,422,104	197	27,811	180	19,234
	1880	4	1,442,000	(3)	(3)	862	284,207	695	(3)	53	(3)	114	(3)
Kentucky	[4]1900	....	....	....	....	....	....	....	....	....	....	....	....
	[5]1890	....	....	....	....	....	....	....	....	....	....	....	....
	1880	5	795,000	....	....	522	150,322	364	(3)	11	(3)	147	(3)
Maryland	1900	7	581,086	31	38,976	742	339,518	562	313,920	54	8,673	126	16,925
	1890	11	871,111	16	12,176	1,397	696,560	1,045	650,921	24	6,864	328	38,775
	1880	7	406,000	(3)	(3)	612	234,254	524	(3)	....	(3)	88	(3)
Massachusetts	1900	5	258,949	39	28,060	387	188,674	343	179,236	19	4,392	25	5,046
	1890	6	365,051	18	17,774	496	201,653	455	195,221	19	3,732	22	2,700
	1880	10	723,000	(3)	(3)	946	383,342	828	(3)	58	(3)	60	(3)
Missouri	1900	3	2,198,316	26	47,448	650	341,375	648	340,825	....	....	2	550
	1890	5	2,201,353	39	54,082	1,113	542,157	1,016	524,373	....	....	97	17,784
	1880	6	1,430,000	(3)	(3)	965	381,098	709	(3)	36	(3)	220	(3)
New Jersey	1900	26	5,397,662	317	284,960	5,383	2,462,745	4,366	2,278,306	170	32,726	847	151,713
	1890	34	3,744,894	152	132,619	5,688	2,730,100	4,601	2,605,798	42	8,405	1,045	115,897
	1880	22	2,568,021	(3)	(3)	3,578	1,300,038	2,762	(3)	46	(3)	770	(3)
New York	1900	27	2,242,834	117	139,698	2,556	1,305,264	2,201	1,239,971	73	17,831	282	47,462
	1890	30	2,297,699	56	61,413	3,229	1,422,626	2,587	1,319,607	92	17,025	650	85,994
	1880	29	1,875,600	(3)	(3)	3,078	1,046,812	2,116	(3)	50	(3)	912	(3)
Ohio	1900	28	5,451,513	199	249,029	4,546	2,067,384	3,505	1,844,958	405	96,017	636	126,409
	1890	59	4,094,677	216	230,323	6,435	2,901,255	5,053	2,700,036	538	74,227	844	126,992
	1880	19	1,172,850	(3)	(3)	1,688	644,520	1,170	(3)	81	(3)	437	(3)
Pennsylvania	1900	119	28,287,187	842	1,110,383	19,420	10,287,491	15,136	9,338,261	1,546	414,250	2,738	534,980
	1890	99	20,459,049	424	518,640	18,510	8,728,520	14,824	8,090,926	749	154,689	2,937	482,905
	1880	77	7,609,706	(3)	(3)	9,784	3,897,306	6,999	(3)	294	(3)	2,491	(3)
West Virginia	1900	16	1,338,084	85	97,551	1,949	789,422	1,319	657,984	468	103,748	162	27,690
	1890	7	825,313	34	46,946	1,371	511,079	970	446,349	190	32,632	211	32,098
	1880	4	550,522	(3)	(3)	946	311,650	615	(3)	100	(3)	231	(3)
All other states[6]	1900	8	711,082	28	36,944	866	455,504	576	402,839	12	4,100	278	48,565
	1890	9	829,262	30	38,196	881	494,811	665	469,490	14	3,000	202	22,321
	1880	6	332,000	(3)	(3)	464	168,524	364	(3)	12	(3)	88	(3)

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[1] Includes proprietors and firm members, with their salaries; number only reported in 1900 but not included in this table. (See Table 12.)
[2] Includes 25 establishments idle or in process of construction, with a capital of $525,100. Not separately reported by states in 1880.
[3] Not reported separately.
[4] No establishments reported.
[5] Included in "all other states."
[6] Includes establishments distributed as follows: 1900—California, 1; Colorado, 1; Delaware, 1; Georgia, 1; Michigan, 1; Virginia, 2; Wisconsin, 1. 1890—California, 1; Colorado, 1; Delaware, 1; Georgia, 2; Kentucky, 2; Michigan, 1; Wisconsin, 1. 1880—California, 1; Connecticut, 1; Iowa, 1; Michigan, 1; New Hampshire, 1.

TABLE 4.—COMPARATIVE STATISTICS, BY STATES: 1880 TO 1890—Continued.

STATES.	Year.	Miscellaneous expenses.	MATERIALS USED.							
			Total cost.	Mixing sand, tons.	Grinding sand, tons.	Soda ash (carbonate of soda) tons.	Salt cake (sulphate of soda), tons.	Nitrate of soda, tons.	Pearlash, pounds.	Litharge, pounds.
United States	1900	$3,588,641	$16,731,009	581,720	265,438	157,779	53,257	10,770	4,406,211	8,386,106
	1890	2,267,696	12,140,985	369,328	227,416	96,777	38,092	7,031	2,544,978	5,501,559
	1880	(1)	8,028,621	155,447	39,500	49,626	7,877	2,859	592,932	2,313,203
Illinois	1900	210,588	674,008	32,978	...	12,017	...	440	...	115,600
	1890	134,625	682,248	23,693	...	7,324	2,143	592	...	40,000
	1880	(1)	297,842	9,767	...	2,495	648	...	...	...
Indiana	1900	690,165	4,582,141	179,367	71,152	48,629	14,371	2,329	453,481	1,482,887
	1890	360,384	865,374	31,821	50,000	7,608	4,694	263	...	...
	1880	(1)	433,733	7,124	52,300	2,854	...	...	...	...
Kentucky	1900	...	...	...	...	...	...	...	...	...
	1890	...	...	...	...	...	...	...	...	...
	1880	(1)	134,104	3,543	...	840	337	49	20,000	7,000
Maryland	1900	26,065	151,500	3,493	...	1,601	...	149	75,000	36,982
	1890	35,847	295,337	12,703	...	2,558	112	230	77,000	94,000
	1880	(1)	239,682	5,344	...	1,902	36	36	...	...
Massachusetts	1900	14,243	137,185	1,622	...	194	125	24	207,967	364,448
	1890	35,760	127,180	1,920	...	386	157	16	74,300	140,750
	1880	(1)	329,864	2,205	...	392	255	75	130,111	298,260
Missouri	1900	98,119	231,515	10,366	4,743	3,048	226	...	...	...
	1890	116,397	557,874	11,690	22,652	4,130	180	63	...	...
	1880	(1)	351,871	8,042	7,200	3,071	...	31	...	...
New Jersey	1900	241,655	1,488,700	81,260	433	20,630	697	1,314	60,270	72,049
	1890	116,009	1,310,953	49,278	...	16,644	1,542	263	34,035	39,873
	1880	(1)	1,088,346	26,282	...	8,274	1,320	120	100	20,000
New York	1900	145,505	899,590	22,820	50	7,508	1,453	548	469,186	822,130
	1890	167,900	825,498	21,050	...	6,444	2,116	232	500,334	1,213,264
	1880	(1)	944,691	16,122	...	5,865	26	194	142,456	559,257
Ohio	1900	155,512	1,253,164	37,707	6,897	11,072	1,751	1,259	850,171	2,063,000
	1890	294,744	1,602,599	54,406	...	12,894	6,607	1,628	335,216	786,991
	1880	(1)	459,333	10,008	...	3,244	233	332	28,000	210,000
Pennsylvania	1900	1,867,879	6,435,463	191,859	182,117	46,398	34,297	4,330	1,938,334	3,143,727
	1890	911,178	5,294,992	149,239	154,764	34,287	20,251	3,277	1,474,093	3,086,681
	1880	(1)	3,350,660	61,452	...	18,419	4,822	1,841	268,496	1,218,686
West Virginia	1900	112,791	593,251	10,025	46	2,847	337	307	351,802	285,283
	1890	40,805	277,033	5,350	...	2,209	...	416	50,000	100,000
	1880	(1)	208,064	3,183	...	1,315	...	179	3,769	...
All other states[2]	1900	26,119	284,492	10,223	...	3,835	...	70	...	...
	1890	54,047	301,897	8,178	...	2,293	290	51	...	...
	1880	(1)	190,431	2,375	...	955	200	2	...	...

STATES.	Year.	MATERIALS USED—continued.							PRODUCTS.
		Lime and quicklime, bushels.	Limestone, tons.	Arsenic, pounds.	Manganese, pounds.	Fire clay and pot clay, pounds.	Pots (not including those made at works), number.	Cost of fuel.[1]	Aggregate value.[3]
United States	1900	993,349	91,015	2,349,261	1,493,538	32,151,017	8,941	$3,203,146	$56,539,712
	1890	929,706	45,482	1,823,007	610,915	37,066,652	8,006	2,340,912	41,051,004
	1880	869,886	2,597	713,974	191,146	17,233,891	13,655	(1)	21,154,571
Illinois	1900	56,734	4,815	45,607	59,838	642,000	309	155,400	2,834,398
	1890	25,525	3,387	121,308	14,336	859,332	498	146,834	2,372,011
	1880	49,607	300	26,100	...	833,000	627	(1)	901,343
Indiana	1900	287,685	27,993	837,487	521,980	8,624,298	2,429	355,300	14,757,883
	1890	61,818	6,877	214,100	87,052	3,153,600	701	89,866	2,995,409
	1880	47,842	...	32,000	...	692,000	1,100	(1)	790,781
Kentucky	[4]1900	...	...	...	...	...	...	...	...
	[5]1890	...	...	...	...	...	...	...	...
	1880	10,300	12	302	1,600	166,000	202	(1)	388,405
Maryland	1900	18,910	185	4,621	11,167	245,900	164	47,980	557,895
	1890	87,698	...	16,520	14,600	2,487,620	363	89,145	1,256,697
	1880	62,865	...	2,710	1,500	692,000	587	(1)	587,000
Massachusetts	1900	699	100	7,789	8,101	66,158	110	33,047	418,458
	1890	20	390	4,275	8,150	330,738	45	44,691	431,437
	1880	2,348	346	6,697	9,049	466,479	150	(1)	854,345
Missouri	1900	762	4,112	24,233	33,000	426,520	58	75,689	765,564
	1890	12,916	2,278	104,811	56,022	2,210,091	98	157,928	1,215,329
	1880	47,275	360	24,000	3,960	951,350	601	(1)	919,827

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[1] Not reported in 1880.

[2] Includes establishments distributed as follows: 1900—California, 1; Colorado, 1; Delaware, 1; Georgia, 1; Michigan, 1; Virginia, 2; Wisconsin, 1. 1890—California, 1; Colorado, 1; Delaware, 1; Georgia, 2; Kentucky, 2: Michigan, 1; Wisconsin, 1. 1880—California, 1; Connecticut, 1; Iowa, 1; Michigan, 1; New Hampshire, 1.

[3] While the aggregate value for the respective states is the aggregate value of products reported for all branches of glass manufacture, this total can not be obtained by adding the amounts given, as the reports of certain products have been suppressed, to avoid disclosing the operations of individual establishments.

[4] No establishments reported.

[5] Included in "all other states."

TABLE 4.—COMPARATIVE STATISTICS, BY STATES: 1880 TO 1900—Continued.

STATES.	Year.	MATERIALS USED—continued.							PRODUCTS.
		Lime and quicklime, bushels.	Limestone, tons.	Arsenic, pounds.	Manganese, pounds.	Fire clay and pot clay, pounds.	Pots (not including those made at works), number.	Cost of fuel.[1]	Aggregate value.[2]
New Jersey	1900	248,654	8,577	102,490	143,465	2,108,845	366	445,828	5,093,822
	1890	198,086	3,397	75,256	17,065	3,841,290	518	384,951	5,218,152
	1880	174,680	455	38,453	12,000	2,880,998	2,118	(1)	2,810,170
New York	1900	41,024	2,462	101,570	90,721	1,033,200	475	227,158	2,756,978
	1890	90,502	778	52,026	32,489	2,775,355	450	244,893	2,723,019
	1880	98,854	.....	6,600	27,505	1,837,650	1,661	(1)	2,420,796
Ohio	1900	94,547	3,356	228,587	76,117	2,549,910	1,199	249,405	4,547,083
	1890	108,597	6,932	375,196	124,581	7,141,278	1,780	156,404	5,649,182
	1880	45,635	.....	28,916	16,436	848,025	835	(1)	1,549,320
Pennsylvania	1900	184,969	38,309	896,074	457,581	15,926,246	3,461	1,421,710	22,011,130
	1890	268,674	20,248	746,393	216,910	13.086,298	3,223	858,281	17,179,137
	1880	309,122	1,124	547,266	110,178	6,495,169	5,170	(1)	8,720,584
West Virginia	1900	19,660	450	80,503	58,944	154,940	350	88,905	1,871,795
	1890	14,107	.....	89,822	16,450	662,550	170	54,885	945,234
	1880	7,533	.....	.....	8,518	933,720	332	(1)	748,500
All other states[3]	1900	39,705	656	20,300	32,624	373,000	20	102,724	924,706
	1890	61,763	1,195	23,300	23,260	518,500	160	113,034	1,065,397
	1880	13,825	.....	930	400	437,500	272	(1)	463,500

STATES.	Year.	PRODUCTS—continued.							
		Building glass.							Pressed and blown glass and bottles and jars, value.
		Total value.	Window.		Plate.				
			50-foot boxes, number.	Value.	Total value.	Total cast, square feet.	Sold rough, square feet.	Polished plate made, square feet.	
United States	1900	[4]$17,096,234	4,341,282	$10,879,355	[5]$6,194,279	[5]34,758,994	628,684	16,883,578	$39,443,478
	1890	13,928,296	3,768,884	9,058,802	[5]4,869,494	[5]19,319,509	3,106,831	9,100,111	27,122,708
	1880	5,915,618	1,864,734	5,047,313	[5]868,305	[5]1,700,227	377,227	1,042,000	15,238,953
Illinois	1900	.....	.....	.....	.....	.....	.....	.....	2,810,398
	1890	.....	.....	.....	.....	.....	.....	.....	1,945,790
	1880	373,343	115,271	373,343	.....	.....	.....	.....	528,000
Indiana	1900	5,711,948	1,701,729	4,176,587	1,520,361	[5]8,553,838	31,917	5,177,160	9,045,935
	1890	1,831,745	360,114	885,745	946,000	2,383,793	100,000	1,758,248	1,163,664
	1880	725,797	91,759	229,397	496,400	970,000	130,000	642,000	64,984
Kentucky	[6]1900	.....	.....	.....	.....	.....	.....	.....	.....
	[7]1890	.....	.....	.....	.....	.....	.....	.....	.....
	1880	3,512	.....	.....	3,512	20,684	20,684	.....	384,893
Maryland	1900	.....	.....	.....	.....	.....	.....	.....	454,633
	1890	.....	.....	.....	.....	.....	.....	.....	674,900
	1880	332,000	141,000	332,000	.....	.....	.....	.....	255,000
Massachusetts	1900	.....	.....	.....	.....	.....	.....	.....	402,258
	1890	72,748	.....	.....	72,748	569,375	434,150	.....	.....
	1880	149,845	41,866	104,002	45,843	209,543	209,543	.....	704,500
Missouri	1900	.....	.....	.....	.....	.....	.....	.....	.....
	1890	.....	.....	.....	.....	.....	.....	.....	.....
	1880	390,550	24,000	68,000	322.550	500,000	17,000	400,000	529,277
New Jersey	1900	274,011	124,541	267,611	.....	.....	.....	.....	4,819,811
	1890	1,316,170	622,432	1,316,170	.....	.....	.....	.....	3,901,982
	1880	729,155	296,685	729,155	.....	.....	.....	.....	2,081,015
New York	1900	346,790	89,522	243,085	.....	.....	.....	.....	2,410,188
	1890	.....	.....	.....	.....	.....	.....	.....	2,000,842
	1880	540,903	216,748	540,903	.....	.....	.....	.....	1,879,893
Ohio	1900	671,422	200,854	519,187	.....	.....	.....	.....	3,875,661
	1890	.....	.....	.....	.....	.....	.....	.....	4,073,385
	1880	358,000	127,122	358,000	.....	.....	.....	.....	1,191,320
Pennsylvania	1900	9,213,545	2,068,340	5,301.131	3,912,414	[5]19,546,674	579,905	10,877,250	12,797,585
	1890	6,406,924	1,430,455	3,648,577	2,758.347	9,024,273	515,177	5,849,519	10,772,213
	1880	2,222,513	780,283	2,222,513	.....	.....	.....	.....	6,498,071
West Virginia	1900	.....	.....	.....	.....	.....	.....	.....	1,770,553
	1890	.....	.....	.....	.....	.....	.....	.....	945,234
	1880	.....	.....	.....	.....	.....	.....	.....	748,500
All other states[3]	1900	878,518	156,296	371,754	761,504	6,658,482	16,862	829,168	1,056,456
	1890	4,300,709	1,355,883	3,208,310	1,092,399	7,342,068	2,057,504	1,492,344	1,644,698
	1880	90,000	30,000	90,000	.....	.....	.....	.....	373,500

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[1] Not reported in 1880,

[2] While the aggregate value for the respective states is the aggregate value of products reported for all branches of glass manufacture, this total can not be obtained by adding the amounts given, as the reports of certain products have been suppressed, to avoid disclosing the operations of individual establishments.

[3] Includes establishments distributed as follows: 1900—California, 1: Colorado, 1; Delaware, 1; Georgia, 1; Michigan, 1: Virginia, 2; Wisconsin; 1. 1890—California, 1; Colorado, 1; Delaware, 1; Georgia, 2; Kentucky, 2; Michigan, 1; Wisconsin, 1. 1880—California, 1; Connecticut, 1; Iowa, 1; Michigan, 1; New Hampshire, 1.

[4] Includes "all other products" for building glass as follows: Indiana, $15,000; New Jersey, $6,400; and Massachusetts, $1,200; total, $22,600.

[5] Includes "cathedral," "skylight," "wire," and "all other products" for this class.

[6] No establishments reported.

[7] Included in "all other states."

TABLE 4.—COMPARATIVE STATISTICS, BY STATES: 1880 TO 1900—Continued.

STATES.	Year.	EQUIPMENT AND CHARACTERISTICS OF WORKS.[1]									
		Furnaces, number.	Pots, number.	Tanks.[2] Number.	Tanks.[2] Pot capacity.	Flattening ovens, number.	Monkey ovens, number.	Casting tables, number.	Annealing ovens, number.	Lehrs, number.	Clay grinding mills, number.
United States	1900	451	5,107	353	4,834	285	2	100	2,409	1,350	71
	1890	564	4,932	...	...	135	19	62	2,142	599	153
	1880	285	2,421	...	...	68	16	16	1,704	...	171
Illinois	1900	10	129	18	306	1	2	4	289	31	...
	1890	27	225	...	...	8	...	6	269	11	4
	1880	8	74	...	...	...	...	...	...	...	...
Indiana	1900	125	1,354	112	1,551	116	...	17	419	437	23
	1890	48	449	...	...	13	2	8	217	43	9
	1880	10	108	...	...	...	...	...	...	...	...
Kentucky	[3]1900	...	...	...	...	...	...	...	...	...	...
	[4]1890	...	...	...	...	...	...	...	...	...	...
	1880	6	47	...	...	...	...	...	...	...	...
Maryland	1900	12	107	1	6	2	...	...	21	20	2
	1890	19	161	...	...	4	...	...	34	23	6
	1880	9	68	...	...	...	...	...	...	...	...
Massachusetts	1900	7	65	1	90	1	...	...	15	13	1
	1890	11	69	...	...	1	...	6	25	8	2
	1880	11	99	...	...	...	...	...	...	...	...
Missouri	1900	7	110	5	73	...	...	14	130	2	1
	1890	13	148	...	...	1	...	23	117	...	7
	1880	7	51	...	...	...	...	...	...	...	...
New Jersey	1900	33	255	51	769	6	...	...	266	100	4
	1890	80	469	...	...	22	1	...	352	50	22
	1880	44	289	...	...	...	...	...	...	...	...
New York	1900	29	247	22	282	5	...	5	131	67	6
	1890	55	400	...	...	14	6	2	105	47	25
	1880	43	339	...	...	...	...	...	...	...	...
Ohio	1900	42	539	18	237	12	...	3	144	119	5
	1890	85	806	...	...	25	1	1	123	142	21
	1880	20	187	...	...	...	...	...	...	...	...
Pennsylvania	1900	168	2,117	93	1,303	138	...	57	880	485	27
	1890	197	1,982	...	...	45	9	16	788	241	48
	1880	112	1,029	...	...	...	...	...	...	...	...
West Virginia	1900	15	156	20	90	2	...	...	18	65	1
	1890	17	144	...	...	...	...	...	18	33	3
	1880	8	82	...	...	...	...	...	...	...	...
All other states[5]	1900	3	28	12	127	2	...	...	96	11	1
	1890	12	79	...	...	2	...	...	94	1	6
	1880	7	48	...	...	...	...	...	...	...	...

STATES.	Year.	EQUIPMENT AND CHARACTERISTICS OF WORKS—continued.									
		Grinding machines, number.	Polishing machines, number.	Shops, number.	Glory holes, number.	Presses or pressing machines, number.	Finishing machines, number.	Crimping machines, number.	Grinding and engraving machines, number.	Horses and mules, number.	Wagons, carts, and drays, number.
United States	1900	227	294	3,978	1,419	964	140	494	137	409	407
	1890	186	214	2,894	880	801	91	233	798	590	484
	1880	70	70	1,353	437	522	...	...	716	749	679
Illinois	1900	...	...	427	146	13	2	1	3	23	24
	1890	4	50	115	48	2	...	...	1	25	13
	1880	...	...	...	...	...	...	...	...	...	...
Indiana	1900	61	86	1,397	351	201	33	169	29	21	23
	1890	43	...	77	32	8	...	...	4	29	27
	1880	...	...	...	...	...	...	...	...	...	...
Kentucky	[4]1900	...	...	...	...	...	...	...	...	...	...
	[5]1890	...	...	...	...	...	...	...	...	...	...
	1880	...	...	...	...	...	...	...	...	...	...
Maryland	1900	1	...	67	24	7	...	...	4	13	17
	1890	3	...	148	23	4	50	15	17	21	21
	1880	...	...	...	...	...	...	...	...	...	...
Massachusetts	1900	...	...	38	16	9	...	5	...	8	9
	1890	...	...	33	7	9	...	...	85	11	11
	1880	...	...	...	...	...	...	...	...	...	...
Missouri	1900	21	24	26	6	...	...	...	...	9	7
	1890	26	50	23	...	...	...	...	...	30	24
	1880	...	...	...	...	...	...	...	...	...	...

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[1] The equipment of glass manufacturing plants, other than furnaces and pots, not having been reported by state totals in 1880, the comparison can be made only for the United States for that year.

[2] Not reported in 1880 and 1890.

[3] No establishments reported.

[4] Included in "all other states."

[5] Includes establishments distributed as follows: 1900—California, 1; Colorado, 1; Delaware, 1; Georgia, 1; Michigan, 1; Virginia, 2; Wisconsin, 1. 1890—California, 1; Colorado, 1; Delaware, 1; Georgia, 2; Kentucky, 2; Michigan, 1; Wisconsin, 1. 1880—California, 1; Connecticut, 1; Iowa, 1; Michigan, 1; New Hampshire, 1.

TABLE 4.—COMPARATIVE STATISTICS, BY STATES: 1880 TO 1900—Continued.

STATES.	Year.	EQUIPMENT AND CHARACTERISTICS OF WORKS—continued.									
		Grinding machines, number.	Polishing machines, number.	Shops, number.	Gloryholes, number.	Presses or pressing machines, number.	Finishing machines, number.	Crimping machines, number.	Grinding and engraving machines, number.	Horses and mules, number.	Wagons, carts, and drays, number.
New Jersey	1900			718	301	55	1		22	98	111
	1890	12		323	199	17			47	122	107
	1880										
New York	1900	3		312	66	49	2	32	9	49	47
	1890	7		236	41	30			23	67	65
	1880										
Ohio	1900	12	10	613	93	125	59	35	5	18	18
	1890	13		441	130	243	21	57	258	31	33
	1880										
Pennsylvania	1900	129	174	144	351	444	42	252	54	134	126
	1890	73	114	1,316	370	403	20	151	303	213	147
	1880										
West Virginia	1900			158	28	60	1		10	6	6
	1890	2		104	24	85		10	60	12	12
	1880										
All other states[1]	1900			78	37	1			1	30	19
	1890	3		78	6					29	24
	1880										

Table 5 presents comparative statistics of glass manufacture, by classes of products, for the years 1880, 1890, and 1900, with the per cent of increase for each decade.

TABLE 5.—COMPARATIVE SUMMARY, BY CLASSES OF PRODUCTS, 1880 TO 1900, WITH PER CENT OF INCREASE FOR EACH DECADE.

	Year.	Total.	Building glass.	Pressed and blown glass and bottles and jars.	PER CENT OF INCREASE.		
					Total.	Building glass.	Pressed and blown glass and bottles and jars.
Number of establishments	1900	355	124	231	20.7	24.0	19.1
	1890	294	100	194	74.0	85.2	68.7
	1880	169	54	115			
Capital	1900	$61,423,903	$26,617,122	$34,806,781	49.9	45.0	53.9
	1890	$40,966,850	$18,353,576	$22,613,274	117.9	151.8	96.4
	1880	$18,804,599	$7,290,155	$11,514,444			
Salaried officials, clerks, etc., number	1900	2,268	615	1,653	107.1	110.6	105.9
	1890	1,095	292	803			
	1880	(2)	(2)	(2)			
Salaries	1900	$2,792,376	$811,983	$1,980,393	126.6	140.2	121.4
	1890	$1,232,561	$338,112	$894,449			
	1880	(2)	(2)	(2)			
Wage-earners, average number	1900	52,818	11,902	40,916	17.7	[3]0.7	24.3
	1890	44,892	11,982	32,910	85.7	147.3	70.2
	1880	24,177	4,846	19,331			
Total wages	1900	$27,084,710	$9,029,673	$18,055,037	29.7	26.1	31.5
	1890	$20,885,961	$7,159,903	$13,726,058	128.4	194.4	104.5
	1880	$9,144,100	$2,431,789	$6,712,311			
Men, 16 years and over	1900	42,173	11,801	30,372	16.9	1.4	24.3
	1890	36,064	11,633	24,431	102.9	154.2	85.1
	1880	17,778	4,577	13,201			
Wages	1900	$24,901,233	$8,999,613	$15,901,620	27.4	27.2	27.5
	1890	$19,546,351	$7,073,965	$12,472,386			
	1880	(2)	(2)	(2)			
Women, 16 years and over	1900	3,529	20	3,509	87.2	[3]70.1	93.0
	1890	1,885	67	1,818	154.4	[3]27.2	180.1
	1880	741	92	649			
Wages	1900	$840,001	$4,901	$835,100	152.8	[3]76.2	168.0
	1890	$332,245	$20,593	$311,652			
	1880	(2)	(2)	(2)			
Children, under 16 years	1900	7,116	81	7,035	2.5	[3]71.3	5.6
	1890	6,943	282	6,661	22.7	59.3	21.5
	1880	5,658	177	5,481			
Wages	1900	$1,343,476	$25,159	$1,318,317	33.4	[3]61.5	39.9
	1890	$1,007,365	$65,345	$942,020			
	1880	(2)	(2)	(2)			

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[1] Includes establishments distributed as follows: 1900—California, 1; Colorado, 1; Delaware, 1; Georgia, 1; Michigan, 1; Virginia, 2; Wisconsin, 1. 1890—California, 1; Colorado, 1; Delaware, 1; Georgia, 2; Kentucky, 2; Michigan, 1; Wisconsin, 1. 1880—California, 1; Connecticut, 1; Iowa, 1; Michigan, 1; New Hampshire, 1.

[2] Not reported separately.

[3] Decrease.

Table 5.—COMPARATIVE SUMMARY, BY CLASSES OF PRODUCTS, 1880 TO 1900, WITH PER CENT OF INCREASE FOR EACH DECADE—Continued.

	Year.	Total.	Building glass.	Pressed and blown glass and bottles and jars.	PER CENT OF INCREASE.		
					Total.	Buildihg glass.	Pressed and blown glass and bottles and jars.
Miscellaneous expenses	1900	$3,588,641	$1,365,865	$2,222,776	58.3	27.7	85.5
	1890	$2,267,696	$1,069,545	$1,198,151	....	....	....
	1880	(1)	(1)	(1)	....	....	....
Cost of materials used	1900	$16,731,009	$4,679,084	$12,051,925	37.8	1.2	60.3
	1890	$12,140,985	$4,621,535	$7,519,450	51.2	102.0	31.0
	1880	$8,028,621	$2,287,987	$5,740,634	....	....	....
Value of products	1900	$56,539,712	$17,096,234	$39,443,478	37.7	22.7	45.4
	1890	$41,051,004	$13,928,296	$27,122,708	94.1	135.4	78.0
	1880	$21,154,571	$5,915,618	$15,238,953	....	....	....
Pot and tank furnaces, number	1900	804	241	563	42.6	23.6	52.6
	1890	564	195	369	97.9	137.8	81.8
	1880	285	82	203	....	....	....
Pot capacity of furnaces, number	1900	9,941	3,726	6,215	101.6	84.1	113.7
	1890	4,932	2,024	2,908	103.7	173.1	73.1
	1880	2,421	741	1,680	....	....	....

[1] Not reported.

Tables 4 and 5 show large increases in the number of salaried officials and their salaries, between 1890 and 1900, caused by the organization of large consolidations in the glass business within the last five years. The most interesting disclosure, however, is the widespread substitution of the tank for the pot furnace for melting glass. No statistics of tank furnaces appear in the report on glass manufacture at the census of 1890, although a number were in existence at that time. These tanks were then largely regarded as in the experimental stage, although it had been demonstrated in 1888 that their operation was a success, particularly in the manufacture of window glass. It was several years before glass manufacturers were convinced of the advantages of the tank over the pot furnace; but from 1890 on, the introduction of the tank has been steady and is the prominent feature of the progress of the American glass industry during the last decade. A larger production and a more uniform quality of glass are rendered possible by the use of the tank system of melting than by the pot-furnace system, especially in the manufacture of window glass and bottles and jars. Although the cost of the installation of the tank system is considerably greater than that of the pot system, the former is much more economical and regular in operation. In many departments of the glass industry it meets the demand for more glass for less money. The introduction of the continuous tank in the manufacture of bottles and jars has been fully as general as in the manufacture of window glass, and continuous and intermittent or day tanks are being more and more extensively used in the manufacture of common tumblers and jellies, opal ware, lantern globes, lamp founts, chimneys, shades, and globes, and novelties and specialties in pressed and blown ware.

The statistics of furnaces are of little value for comparative purposes, owing to the general introduction of the tank furnace during the last decade. The following comparisons have been made on the assumption that all furnaces reported in 1890 were pot furnaces; this is not strictly correct, as it is known that there were several tank furnaces in operation at that time, but they were not shown separately in the published statistics. The number of tank furnaces reported was small, however, and would not materially affect the comparisons.

Since 1890 there has been a decrease of 20 per cent in the total number of pot furnaces, 564 being reported in 1890 and 451 in 1900. In building glass, 195 pot furnaces were reported in 1890 and 193 in 1900, a decrease of only 2, while the decrease in the number of pot furnaces for pressed and blown glass and bottles and jars was 111, or 30.1 per cent, 369 being reported in 1890 and 258 in 1900. However, in 1900 there is a total increase for the United States of 353 tanks—206 continuous and 147 day—making a gain in the total number of melting furnaces in 1900 over 1890 of 240, or 42.6 per cent. In building glass, 34 continuous and 14 day tanks were reported in 1900, making an increase in the total number of furnaces for that class in 1900 of 23.6 per cent over the number reported in 1890. In the class of pressed and blown ware and bottles and jars, 172 continuous and 133 day tanks were reported in 1900, making a gain of 52.6 per cent in the total number of furnaces in that division in 1900 over the total for 1890.

By estimating the ring capacity of the continuous tank in building glass establishments as equal to 3 pots, and in pressed and blown glass and bottle and jar establishments as equal to 2 pots, and estimating the ton capacity of the day tank in both classes as equal to a like pot capacity, the 353 tanks have a total capacity of 4,834 pots, 1,430 of which are in building glass factories and 3,404 in pressed and blown glass and bottle and jar factories. A comparison of the capacity of the pot furnaces reported in 1900 with the capacity reported in 1890, shows an increase in capacity of 3.5 per cent; an increase in building glass capacity of 13.4 per cent; and a decrease in pressed and blown ware and bottle and jar capacity of 3.3 per cent. However, the total capacity of both pot furnaces and tanks for the entire industry in 1900 increased 101.6 per cent over 1890; of building glass capacity, 84.1 per cent; and of pressed and blown ware and bottles and jars, 113.7 per cent. The increase of only 23.6 per cent in the number of furnaces in building glass factories, with an increase of 84.1 per cent in the pot capacity, indicates the much larger capacity of the average window tank than that of the tank used in the production of pressed and blown ware and bottles and jars, where the number of furnaces increased 52.6 per cent and the pot capacity increased 113.7 per cent. The day tank in building glass factories is used in the manufacture of skylight, tile glass, etc.

The general introduction of the tank for glass melting has created, within the past decade, a separate industry of considerable magnitude—the preparation of the clay for the construction of tanks. At the same time the manufacture of the glass melting pot has been transferred largely from the glass factory to a few establishments that make a specialty of its manufacture.

Table 6 presents the rank of states in glass manufacture as a whole from 1880 to 1890, according to value of products, with the percentages of total value of products for the United States.

TABLE 6.—RANK OF STATES ACCORDING TO VALUE OF PRODUCTS: 1880 TO 1900, WITH PER CENT OF TOTAL VALUE.

STATES.	RANK.			VALUE OF PRODUCTS.			PER CENT OF TOTAL VALUE.		
	1900	1890	1880	1900	1890	1880	1900	1890	1880
United States				$56,539,712	$41,051,004	$21,154,571	100.0	100.0	100.0
Pennsylvania	1	1	1	22,011,130	17,179,137	8,720,584	38.9	41.8	41.2
Indiana	2	4	8	14,757,883	2,995,409	790,781	26.1	7.3	3.7
New Jersey	3	3	2	5,093,822	5,218,152	2,810,170	9.0	12.7	13.3
Ohio	4	2	4	4,547,083	5,649,182	1,549,320	8.1	13.8	7.3
Illinois	5	6	6	2,834,398	2,372,011	901,343	5.0	5.8	4.3
New York	6	5	3	2,756,978	2,723,019	2,420,796	4.9	6.6	11.5
West Virginia	7	9	9	1,871,795	945,234	748,500	3.3	2.3	3.5
Missouri	8	8	5	765,564	1,215,329	919,827	1.4	3.0	4.4
Maryland	9	7	10	557,895	1,256,697	587,000	1.0	3.1	2.8
Massachusetts	10	10	7	418,458	431,437	854,345	0.7	1.0	4.0
Wisconsin	11	13		(1)	(1)	(2)			
California	12	14	13	(1)	(1)	140,000			0.7
Virginia	13			(1)	(2)	(2)			
Delaware	14	16		(1)	(1)	(2)			
Georgia	15	12		(1)	(1)	(2)			
Michigan	16	17	14	(1)	(1)	90,000			0.4
Colorado	17	15		(1)	(1)	(2)			
Kentucky		11	11	(2)	(1)	388,405			1.8
Connecticut			12	(2)	(2)	160,000			0.8
New Hampshire			15	(2)	(2)	70,000			0.3
Iowa			16	(2)	(2)	3,500			(3)
All other states[4]				924,706	1,065,397		1.6	2.6	

[1] Included in "all other states."
[2] Not reported.
[3] Less than one-tenth of 1 per cent.
[4] Includes the following states: 1890—California, Colorado, Delaware, Georgia, Kentucky, Michigan, Wisconsin; 1900—California, Colorado, Delaware, Georgia, Michigan, Virginia, Wisconsin.

Glass manufacture was reported in 17 states in 1900; in 17, in 1890; and in 16, in 1880. Wisconsin, Virginia, Delaware, Georgia, and Colorado were not reported in 1880. Iowa, New Hampshire, and Connecticut dropped out of the producing column in 1890, but Wisconsin, Delaware, Georgia, and Colorado were added. In 1900, Virginia, the home of the first glass factory, was again reported. No reports of glass manufacture were made from Kentucky in 1900. Since 1900 glass factories have been projected in Washington, Kansas, Tennessee, and South Carolina.

Pennsylvania has occupied first place as a glass-producing state for the last three decades. The discovery of gas in Indiana attracted many factories early in the last decade, especially from Ohio, where the gas was practically exhausted for factory purposes after a few years' existence. As a result, in 1900 Indiana has changed places with Ohio as a glass-producing state, the value of its product in 1900 being nearly five times that of 1890. New Jersey, the third state in 1900 and 1890, and the second in 1880, has held its prominent position by virtue of good sand deposits and advantageous geographical position, and largely from the fact that there are numerous native glass workers in the state not at all inclined to leave, even when better positions are offered elsewhere. There are indications, however, that this reserve on the part of the New Jersey workman is disappearing, and it is a question if the state will continue to hold its present position. West Virginia, which was ninth in glass manufacture in 1890, was seventh in the value of its glass products in 1900, increasing nearly 100 per cent during the decade. The excellent fuel resources of this state, in view of the rapid decline of the gas fields of Indiana, have recently greatly stimulated the growth of its glass manufacture, and will no doubt have the effect of placing it among the leading states in the industry.

The direction of the growth of the industry has always closely followed the fuel supply. The evident failing of the gas supply in Indiana has fixed attention on the gas field of southeastern Kansas, and it is probable that in a short time the industry will be established in that section, although unfavorable freight rates and the refusal of the citizens to hold out tempting cash bonuses for the location of factories have so far kept the glass factory out of that field. Some establishments now in Indiana are likely to be soon moved to the gas fields of West Virginia or western Pennsylvania, and some have already been transferred into the coal fields of Indiana and Illinois and will operate with gas produced from the coal of these states. The largest factories in the Indiana gas field are likely to be soon equipped to operate with gas produced from coal, which will give the glass industry of the state a permanency always lacking when cheap natural gas is the fuel used. During the present decade, owing to the absence of a great cheap fuel supply and the steady adoption of the producer gas-fuel system, many factories will be located at new points within convenient access to the great glass consuming sections, particularly in the West. The Pacific coast is attracting more and more attention as a field for glass manufacture, and the cheap fuel oil of southern California, coupled with the growing demand for a glass package from the fruit packers, will probably lead to a decided increase in the glass production of that state within a very short time.

BUILDING GLASS.

Table 7 presents comparative statistics, by states, for the building glass industry, for 1890 and 1900.

TABLE 7.—COMPARATIVE STATISTICS, BUILDING GLASS: 1890 AND 1900.

STATES.	Year.	Number of establishments.	Capital.	SALARIED OFFICIALS, CLERKS, ETC.		AVERAGE NUMBER OF WAGE-EARNERS AND TOTAL WAGES.							
						Total.		Men, 16 years and over.		Women, 16 years and over.		Children, under 16 years.	
				Number.	Salaries.	Average number.	Wages.	Average number.	Wages.	Average number.	Wages.	Average number.	Wages.
United States	1900	124	$26,617,122	615	$811,983	11,902	$9,029,673	11,801	$8,999,613	20	$4,901	81	$25,159
	1890	100	18,353,576	[1] 292	[1] 338,112	11,982	7,159,903	11,633	7,073,965	67	20,593	282	65,345
Indiana	1900	51	7,080,415	224	274,105	3,912	3,251,819	3,908	3,250,119	....	....	4	1,700
	1890	11	2,897,100	52	45,377	1,530	914,539	1,499	907,201	17	5,860	14	1,478
Massachusetts	[2] 1900	....	....	....	....	....	....	....	....	....	....	....	....
	1890	3	58,750	3	1,250	84	26,602	84	26,602	....	....	....	....
New Jersey	1900	4	218,990	8	6,326	230	163,245	230	163,245	....	....	....	....
	1890	12	967,923	22	16,288	1,082	720,184	1,048	717,104	....	....	34	3,080
New York	1900	7	334,035	11	15,160	228	164,291	226	163,979	....	....	2	312
	[2] 1890	....	....	....	....	....	....	....	....	....	....	....	....
Ohio	1900	7	2,039,134	25	22,570	477	376,006	477	376,006	....	....	....	....
	[2] 1890	....	....	....	....	....	....	....	....	....	....	....	....
Pennsylvania	1900	46	14,661,120	307	435,015	6,459	4,706,720	6,368	4,679,801	20	4,901	71	22,018
	1890	28	9,715,850	104	145,152	5,399	3,258,692	5,172	3,192,078	50	14,733	177	51,881
All other states[3]	1900	9	2,283,428	40	58,807	596	367,592	592	366,463	....	....	4	1,129
	1890	46	4,713,953	111	130,045	3,887	2,239,886	3,830	2,230,980	....	....	57	8,906

STATES.	Year.	Miscellaneous expenses.	MATERIALS USED.										
			Aggregate cost.	Glass sand.		Soda ash (carbonate of soda).		Salt cake (sulphate of soda).		Nitrate of soda.		Limestone.	
				Tons.	Cost.	Tons.	Cost.	Tons.	Cost.	Tons.	Cost.	Tons.	Cost.
United States	1900	$1,365,865	$4,679,084	177,966	$298,879	25,500	$338,534	52,789	$512,835	614	$9,262	60,274	$106,540
	1890	1,069,545	4,621,535	157,792	352,904	22,715	718,098	35,624	561,398	76	3,605	38,912	117,690
Indiana	1900	348,665	1,319,675	59,746	102,019	8,037	106,833	14,158	180,018	50	1,875	18,911	31,987
	1890	297,127	510,845	18,785	47,431	2,567	79,137	4,409	55,970	....	....	6,467	15,577
Massachusetts	[2] 1900	....	....	....	....	....	....	....	....	....	....	....	....
	1890	2,112	32,921	958	2,626	210	6,560	157	4,710	....	....	195	450
New Jersey	1900	12,141	86,720	2,763	2,833	615	11,396	500	5,700	....	....	350	850
	1890	40,258	366,203	14,594	16,991	4,183	129,866	42	876	....	....	3,337	13,528
New York	1900	14,569	120,748	2,977	3,773	59	1,433	1,453	13,605	23	1,056	917	1,621
	[2] 1890	....	....	....	....	....	....	....	....	....	....	....	....
Ohio	1900	19,505	158,526	5,851	7,836	666	9,669	1,751	18,428	....	....	1,982	3,102
	[2] 1890	....	....	....	....	....	....	....	....	....	....	....	....
Pennsylvania	1900	867,168	2,697,041	95,176	172,003	13,206	168,022	34,239	286,548	541	6,331	34,910	62,380
	1890	391,847	2,236,396	71,085	190,178	7,017	240,799	20,036	342,947	....	....	18,193	60,734
All other states[3]	1900	103,817	296,374	11,453	10,415	2,917	41,181	688	8,536	....	....	3,204	6,600
	1890	338,201	1,475,170	52,370	95,678	8,738	261,736	10,980	156,895	76	3,605	10,720	27,401

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[1] Includes proprietors and firm members, with their salaries; number only reported in 1900 but not included in this table. (See Table 13.)

[2] Included in "all other states."

[3] Includes establishments distributed as follows: 1900—Illinois, 1; Maryland, 2; Massachusetts, 1; Missouri, 2; West Virginia, 2; and Delaware, 1. 1890—Plate glass: Illinois, 2; Missouri, 2; New York, 1; and Ohio, 1. 1890—Window glass: Delaware, 1; Illinois, 3; Maryland, 4; Massachusetts, 1; Michigan, 1; Missouri, 1; New York, 8; and Ohio, 21.

TABLE 7.—COMPARATIVE STATISTICS, BUILDING GLASS: 1890 AND 1900—Continued.

STATES.	Year.	MATERIALS USED—continued.											
		Lime and quick-lime.		Arsenic.		Manganese.		Grinding sand.		Rouge.		Fire clay and pot clay.	
		Cwt.	Cost.	Pounds.	Cost.	Pounds.	Cost.	Tons.	Cost.	Pounds.	Cost.	Pounds.	Cost.
United States	1900	125,030	$12,315	1,321,130	$63,067	68,600	$2,316	263,933	$160,305	835,749	$24,448	23,510,700	$170,522
	1890	92,026	17,590	1,092,622	38,191	126,322	5,335	227,416	151,995	1,116,669	64,390	26,050,242	240,137
Indiana	1900	12,060	1,745	517,839	25,867	13,000	735	70,853	36,811	267,345	9,061	7,282,228	57,310
	1890	1,772	435	113,500	4,479	42,000	1,760	50,000	20,000	150,000	7,350	2,918,000	25,985
Massachusetts	[1]1900	....	....	....	....	....	....	....	....	....	....	....	....
	1890	16	6	2,000	60	5,000	250	....	....	....	....	105,212	727
New Jersey	1900	72,922	2,373	5,085	280	....	....	....	....	....	....	196,840	2,148
	1890	14,050	5,613	11,724	403	....	....	....	....	....	....	1,057,500	14,653
New York	1900	....	....	40,552	2,066	1,200	63	....	....	....	....	288,750	2,438
	[1]1890	....	....	....	....	....	....	....	....	....	....	....	....
Ohio	1900	3,150	482	105,243	4,875	....	....	6,800	2.040	14,900	723	1,603,910	4,749
	[1]1890	....	....	....	....	....	....	....	....	....	....	....	....
Pennsylvania	1900	20,185	3,919	610,807	27,923	20,400	643	181,537	119,557	532.524	13,971	13,365,852	97,832
	1890	13,117	3,697	582,279	19,663	4,500	190	154,764	120,669	640,669	52,154	9,587,565	112,544
All other states[2]	1900	16,713	3,796	41,604	2,056	34,000	875	4,743	1,897	20,980	693	773,120	6,045
	1890	63,071	7,839	383,119	13,586	74,822	3,135	22,652	11,326	326,000	4,886	12,381,965	86,228

STATES.	Year.	MATERIALS USED—continued.									
		Pots (not including those made at works).		Fuel.							All other materials, cost.
				Total cost.	Natural gas, cost.	Oil.		Coal.		All other fuel, cost.	
		Number.	Cost.			Gallons.	Cost.	Tons.	Cost.		
United States	1900	3,830	$101,061	$1,119,022	$751,354	723,654	$23,161	269,611	$335,856	$8,651	$1,759,978
	1890	2,587	87,434	990,993	328,274	47,250	2,250	414,576	611,743	48,726	1,271,775
Indiana	1900	1,482	45,035	195,376	193,590	489	78	432	1,138	570	525,003
	1890	447	15,885	81,958	200	....	....	64,525	80,758	1,000	154,878
Massachusetts	[1]1900	....	....	....	....	....	....	....	....	....	....
	1890	26	340	13,483	....	....	....	4,083	10,500	2,983	3,709
New Jersey	1900	65	1,300	30,343	....	133,414	4,070	12,406	24,905	1,368	29,497
	1890	159	4,445	119,741	....	47,250	2,250	33,581	101,198	16,293	60,087
New York	1900	332	10,395	42,741	....	54,171	2,742	20,769	37,450	2,549	41,557
	[1]1890	....	....	....	....	....	....	....	....	....	....
Ohio	1900	336	9,110	35,772	11,212	113	25	28,593	24,323	212	61,740
	[1]1890	....	....	....	....	....	....	....	....	....	....
Pennsylvania	1900	1.366	25,641	710,415	535,070	177,256	5,679	161,368	166,866	2,800	1,001,856
	1890	912	43,042	375,254	298,590	....	....	67,643	74,125	2,539	674,525
All other states[2]	1900	249	9,580	104,375	11,482	358,211	10,567	46,043	81,174	1,152	100,325
	1890	1,043	23,722	400,557	29,484	....	....	244,744	345,162	25,911	378,576

[1] Included in "all other states."

[2] Includes establishments distributed as follows: 1900—Illinois, 1; Maryland, 2; Messachusetts, 1; Missouri, 2; West Virginia, 2; and Delaware, 1. 1890—Plate glass: Illinois, 2; Missouri, 2; New York, 1; and Ohio, 1. 1890—Window glass: Delaware, 1; Illinois, 3; Maryland, 4; Massachusetts, 1; Michigan, 1; Missouri, 1; New York 8; and Ohio 21.

TABLE 7.—COMPARATIVE STATISTICS, BUILDING GLASS: 1890 AND 1900—Continued.

STATES.	Year.	PRODUCTS.										
		Building glass.										
		Total value.[1]	Window.		Plate.							All other products, value.
					Total cast.	Rough, sold.		Polished plate made.		Cathedral.		
			Boxes.	Value.	Square feet.	Square feet.	Value.	Square feet.	Value.	Square feet.	Value.	
United States	1900	$17,096,234	4,341,282	$10,879,355	34,758,994	628,684	$75,887	16,883,578	$5,158,598	8,846,361	$567,252	$415,142
	1890	13,928,296	3,768,884	9,037,187	[2]19,319,509	3,106,831	337,057	9,100,111	4,172,484	2,773,824	279,407	102,161
Indiana	1900	5,711,948	1,701,729	4,176,587	8,553,838	31,917	4,780	5,177,160	1,415,224	...	...	15,000
	1890	1,831,745	360,114	885,745	2,383,793	100,000	20,000	1,758,248	886,000	...	...	40,000
Massachusetts	[3]1900	...	...	...	...	...	...	...	...	...	...	...
	1890	72,748	...	...	569,375	434,150	59,025	...	...	...	...	13,723
New Jersey	1900	274,011	124,541	267,611	...	...	...	...	...	...	...	6,400
	1890	1,316,170	622,432	1,295,100	...	...	...	...	...	...	...	21,070
New York	1900	346,790	89,522	243,085	...	...	...	...	...	...	...	57,011
	[3]1890	...	...	...	...	...	...	...	...	...	...	...
Ohio	1900	671,422	200,854	519,187	...	...	...	...	...	...	...	...
	[3]1890	...	...	...	...	...	...	...	...	...	...	...
Pennsylvania	1900	9,213,545	2,068,340	5,301,131	19,546,674	579,905	68,032	10,877,250	3,441,734	...	...	331,648
	1890	6,406,924	1,430,455	3,648,577	9,024,273	515,177	82,232	5,849,519	2,676,115	...	...	...
All other states[4]	1900	878,518	156,296	371,754	6,658,482	16,862	3,075	829,168	301,640	8,846,361	567,252	5,083
	1890	4,300,709	1,355,883	3,207,765	7,342,068	2,057,504	175,800	1,492,344	610,369	2,773,824	279,407	27,368

STATES.	Year.	EQUIPMENT AND CHARACTERISTICS OF WORKS.												
		Furnaces, number.	Pots, number.	Tanks.[5]		Flattening ovens, number.	Monkey ovens, number.	Casting tables, number.	Annealing ovens, number.	Clay-grinding mills, number.	Grinding machines, number.	Polishing machines, number.	Horses and mules, number.	Wagons, carts, and drays, number.
				Number.	Pot capacity.									
United States	1900	193	2,296	48	1,430	285	2	100	869	63	227	294	92	93
	1890	195	2,024	...	...	135	19	62	542	75	123	214	220	187
Indiana	1900	82	825	13	552	116	...	17	258	22	61	86	14	13
	1890	27	333	...	...	13	2	8	172	9	39	50	22	21
Massachusetts	[3]1900	...	...	...	...	...	...	...	...	...	...	...	...	...
	1890	6	22	...	...	...	...	6	21	...	...	...	3	3
New Jersey	1900	3	24	3	72	6	...	...	...	3	...	...	6	7
	1890	24	188	...	...	22	1	...	...	9	...	...	27	28
New York	1900	9	65	...	...	5	...	5	5	6	3	...	5	3
	[3]1890	...	...	...	...	...	...	...	...	...	...	...	...	...
Ohio	1900	13	162	2	66	12	...	3	23	3	12	10	3	2
	[3]1890	...	...	...	...	...	...	...	...	...	...	...	...	...
Pennsylvania	1900	66	1,014	29	731	138	...	57	485	23	129	174	47	52
	1890	61	750	...	...	45	9	16	245	22	59	114	93	60
All other states[4]	1900	20	206	1	9	8	2	18	98	6	22	24	17	16
	1890	77	731	...	...	55	7	32	104	35	25	50	75	75

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[1] While the total value for the respective states is the total value of products reported for all classes of the building glass manufacture, this total can not be obtained by adding the amounts given, as the reports of certain products have been suppressed to avoid disclosing the operations of individual establishments.

[2] Includes 4,338,743 square feet of skylight, ribbed glass, opalescent glass, etc.

[3] Included in "all other states."

[4] Includes establishments distributed as follows: 1900—Illinois, 1; Maryland, 2; Massachusetts, 1; Missouri, 2; West Virginia, 2; and Delaware, 1. 1890—Plate glass: Illinois, 2; Missouri, 2; New York, 1; and Ohio, 1. 1890—Window glass: Delaware, 1; Illinois, 3; Maryland, 4; Massachusetts, 1; Michigan, 1; Missouri, 1; New York, 8; and Ohio, 21.

[5] Not reported in 1890.

Of the 124 establishments reporting for 1900, 13 manufacture polished plate glass, 9 of which also make skylight; 11, rough, rolled, or ribbed glass, cathedral, wire, or skylight glass, or glass tiling and no plate glass; and 100, window glass.

Plate Glass.—The plate-glass establishments are located as follows, by states: 8 in Pennsylvania; 3 in Indiana; and 1 each in Missouri and Ohio. The total capacity of these plants is 53 furnaces with 1,100 pots, having an estimated capacity of 31,866,000 square feet a year. However, only 696 pots were active during the census year, casting 21,172,129 square feet of glass, 16,883,578 square feet of which were polished, and 628,684 square feet sold as rough glass. In 1900, 85.5 per cent more polished plate glass was made than in 1890, while the prices at which it sold were 33.3 per cent under those of 1890. In 1876, three years after the first substantial success in the manufacture of polished plate glass in the United States, the domestic production was about 600,000 square feet, and importations for consumption were 4,628,439 square feet, indicating a total plate-glass consumption in the United States of 5,228,439 square feet, against sales of foreign and domestic glass in 1900 of about 18,000,000 square feet, the imports of plate glass for consumption for the year amounting to 1,064,079 square feet.

After abortive attempts to successfully manufacture polished plate glass in this country, at Cheshire, Mass., in 1852–53, and at Lenox Furnace, Mass., in 1855–1871,[1] the first successful production of polished plate glass occurred at the plant at New Albany, Ind., built in 1869 by Capt. J. B. Ford, and operated after 1872 by W. C. DePauw. Not until 1873 did the plant succeed in producing polished plate glass, and Mr. De Pauw stated[2] that not until 1879 was it possible to produce the glass at a profit. This plant was dismantled at some time during the last decade because of unfavorable location and obsolete equipment. The manufacture of polished plate glass was commenced at Crystal City, Mo., in 1875, by the American Plate Glass Company, which company was reorganized the following year by the Hon. E. A. Hitchcock as the Crystal City Plate Glass Company, and has continued in successful operation since, the plant now being owned by the Pittsburg Plate Glass Company, which owned 10 of the 13 establishments reported in 1900. When Captain Ford left New Albany in 1872,[3] he at once located a plant at Louisville, Ky., leaving there in 1875, and starting a plant at Jeffersonville, Ind. These 4 establishments were the ones reported at the census of 1880.

The large profits made by these establishments caused a boom in plate glass factory erection, which was further stimulated by the discovery of gas in Indiana about 1890, the success of natural gas in the manufacture of plate glass having been demonstrated in the factory built by Captain Ford at Creighton, Pa., in 1883. In 1893 Hon. E. A. Hitchcock stated before the Ways and Means Committee of the House of Representatives that there were 12 establishments manufacturing polished plate glass, located at Creighton, Tarentum, Charleroi, Ford City, Butler, Duquesne, and Irwin, in Pennsylvania; New Albany, Elwood, Kokomo, and Alexandria, in Indiana; and Crystal City, Mo. These establishments manufactured plate glass largely in excess of the consumption, and a period of low prices followed, that led, in 1895, to the consolidation of eight establishments under the head of the Pittsburg Plate Glass Company. The outside establishments were the DePauw, at New Albany, Ind.; the American, at Alexandria, Ind.; the Standard Plate Glass Company, at Butler, Pa.; and the Penn Plate Glass Company, at Irwin, Pa. The plant at New Albany was soon abandoned and that at Alexandria was closed, but on the burning of the factory at Irwin about two years ago, the Penn Plate Glass Company secured the factory at Alexandria, Ind., and now operates it as the American Plate Glass Company.

In 1897 the Marsh Plate Glass Company erected a plant at Walton (now Floreffe), Pa., to manufacture thin plate glass under the patents of George Marsh, which substituted a table for holding the plate by a vacuum process in place of plaster of paris, during the grinding and polishing. The Marsh Company claimed to be able to successfully manufacture polished plate glass in all popular glazing sizes as thin as one-sixteenth of an inch, and by their improved table and system of holding the glass, to practically eliminate all breakage. Before this claim was fully demonstrated, the plant was bought by the Pittsburg Plate Glass Company, and has since been used largely as an experimental factory. Experiments in the manufacture of thin plate glass are also being tried at the plant of the Pittsburg Company at Ford City, Pa. The Marsh Company was the first to successfully introduce the continuous lehr for annealing plate glass, a process that promises to soon displace the slower and more expensive annealing kiln system. A factory was erected near Toledo, Ohio, by the Edward Ford Plate Glass Company in 1900, which was in operation only six months during the census year. This factory is equipped with a continuous lehr, and in the extensive use of electricity as motive power is an innovation.

The principal improvement in plate glass manufacture during the last decade was undoubtedly the successful introduction of the annealing lehr, as noted above, at the plant of the Marsh Plate Glass Company, at Walton, Pa. Although its introduction into the older plants has so far been slow, owing to the expense attending the abandonment of the costly kiln system in use at those plants, yet competition will soon have the effect of bringing the lehr into general use. Previous to the introduction of the lehr, the annealing of plate glass was done in practically the same manner as at the commencement of the industry in this country. As soon as the cast is made the plate is introduced into the annealing oven or kiln, a large, shallow, reverberatory furnace of brick, on the smooth floor of which the plate is laid. The kiln being heated to near the melting point and all openings tightly closed, it is allowed to cool gradually to a point where it is opened and the plate removed, the process requiring fully three days.

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[1] Tenth Census of the United States, Report on Glass Manufacture; by Joseph D. Weeks, Special Agent, page 98.

[2] Ibid., page 99.

[3] Ibid., page 99.

The plate glass annealing lehr averages about 200 feet in length, and starts from the casting table as a continuous, connected series of five kilns, after which it is the usual rod lehr common in window glass manufacture. The five stations at the start are on a solid hearth of especially prepared clay, giving an absolutely smooth, level bed. The whole interior of the lehr is brilliantly lighted by electricity, and the heat at any point can be controlled with the utmost nicety by the use of pyrometers. After the cast is made the plate is introduced into the first station of the lehr, where the temperature is near the melting point. In due time the plate passes into the second station, where the temperature is lower. So the plate passes through the five stations with a diminishing temperature. When the plate leaves the fifth station, it has become thoroughly "set," and passes to the rod lehr, which carries it along through decreasing temperatures until, three hours after the cast was made, the annealing process is complete, and the plate is taken out of the lehr ready for the grinding process. The time required to anneal a plate under the lehr system, compared with that under the kiln system—three hours as against three days—indicates the revolutionizing possibilities of the lehr, when cost of construction is also taken into consideration. A lehr that will anneal the product of 96 pots, or 96 plates of glass a day, costs about $20,000 to build, and displaces 96 old-style three-plate kilns, which cost about $1,000 each to build. The lehr takes up far less space than does the kiln system, and the building required for the lehr costs about $6,000, as against $30,000 for the construction of the proper building for the 96 kilns it would displace.

With the lehr, smaller pots are used and thinner and smaller plates cast, resulting in a great increase in the average size of the finished plate, as the smaller the original cast, the better are the chances for the plate going through the annealing, grinding, and polishing processes successfully without diminution of size. The lehr-annealed plate, is much straighter than that annealed in the kiln, owing to the solid hearth of the first five stations of the lehr; the floor of the kiln is much more liable to develop inequalities which misshape the plate. The thinness of the lehr-annealed plate means less time spent in grinding, and the smaller size of the rough plate, makes it possible to lay and relay the lehr-annealed plate on the grinding and polishing tables, much quicker, and with less labor, than the kiln-annealed plate.

H. L. Dixon, the well-known glass furnace engineer, asserts that 90 per cent of the polished plate glass manufactured can be annealed in the lehr, the remaining 10 per cent being glass in extremely large sizes, requiring the old style kiln. He is convinced that it is only a question of time until the very largest sizes can be annealed in the lehr. It is claimed that actual practice has shown that the average size of the lehr-annealed glass, cast from small pots, is 90 square feet per plate when squared, while under the kiln system, with large pots and the attempt to continually cast extreme sizes, the average size of the plate taken from the kiln and squared is about 60 square feet, and when finished, about 18 square feet. In addition to the lehr at Floreffe, Pa., the Pittsburg Plate Glass Company reported 3 lehrs at Ford City, Pa., 2 of the 3 being for large sizes and the third for small sizes of about 50 to 60 square feet. The Ford Plate Glass Company, near Toledo, Ohio, report 1 lehr that is said to operate successfully on sizes of 50 to 60 square feet. At Alexandria, Ind., the American Plate Glass Company have a lehr which is said to be working satisfactorily with plates from 75 to 80 square feet.

As is often the case with important inventions, the successful introduction of the lehr in plate glass manufacture came, not from experts, but from novices in the plate glass business, who carried it to success, while the plate glass manufacturers greeted it with derision and declared it impossible. Henry Fleckner, a veteran window glass factory manager of Pittsburg, was the man who first operated the lehr with success at Walton, and the successful operation of the lehrs at Ford City and Toledo, is said to be largely due to Eugene Morenus, a window glass factory manager, and Ralph Gray, a manufacturer of skylight glass.

In addition to the lehr, the Marsh Plate Glass Company at Walton introduced, in the Marsh patent table, the idea of reducing the temperature of the glass while being ground and polished, by the circulation of a constant flow of water under the table. This cooling device, which permits the operation of the grinders and polishers at a much higher speed, has been installed in several foreign factories by Mr. Marsh, and will no doubt soon be put into use in this country. The transfer tables introduced at Ford City, Pa., in the last decade, have added considerably to the rapidity and ease of production, as has also the extended use of electricity as a lifting and motive power. Prior to the adoption of the transfer table, the grinding and polishing tables were stationary, and after one side of the plate had been ground and polished, it was necessary to remove it from its bed of plaster to continue the process. The transfer table is movable from grinder to polisher, thus making it possible to grind and polish one side of a plate without turning it, effecting a great saving in time and decreasing the loss by breakage attending the operation of moving the plate from its bed of plaster of paris.

President John Pitcairn, of the Pittsburg Plate Glass Company, testified[1] before the subcommission of the United States Industrial Commission, at Philadelphia, Pa., December 22, 1900, that since the inception of the plate glass industry in this country, the tendency of prices has been downward, except during 1900, when prices were increased, as a result of an average increase in the cost of raw materials of about 85 per cent, increased cost of manufacture, owing to the diminution of the gas supply, and the substitution of coal, and a better understanding among the manufacturers. He submitted the following table of prices, at periods of five years from 1875 to 1900:

SQUARE FEET.	1875	1880	1885	1890	1895	1900
1 to 3	$0.71	$0.51	$0.46	$0.40	$0.30	$0.31
3 to 5	0.84	0.61	0.55	0.48	0.36	0.38
5 to 10	1.12	0.80	0.72	0.64	0.48	0.60
10 to 25	1.49	1.06	0.96	0.85	0.63	0.81
25 to 50	1.56	1.11	1.01	0.89	0.66	0.85
50 to 100	1.69	1.21	1.09	0.97	0.72	0.90

During 1897, overproduction resulted in a demoralized condition of the industry, and prices were very low. The advance in prices from that time to 1900 was estimated by Mr. Pitcairn to amount to from 50 to 60 per cent. According to the same authority, about two-thirds of the American plate-glass production is sold in sizes under 10 square feet and without profit, a very large part of this two-thirds being sold at a loss. This glass comes into competition with the imported German looking-glass plate, which is blown, ground, and polished, and imported largely into this country to be silvered and used in cheap mirrors. For several years the American plate-glass manufacturers have been meeting this glass, and by a special arrangement with the manufacturers of furniture and mirrors, have succeeded in displacing it with domestic plate glass of a better quality, at prices less than the cost of production. Since 1895 the bulk of the American polished plate glass has been sold direct to the consumer, the Pittsburg Plate Glass Company having established jobbing houses in nearly a score of the large cities, in which branch of the business $4,044,000 was invested in 1900.

For years and with but slight interruptions, the plate-glass manufacturing interests of Europe have been closely allied as to regulation of prices and adjustment of production. As the business of the plate-glass industry in the United States has never been extended beyond the home market, cooperation on that account has not been considered valuable by the European interests; hence, this market has been a "dumping ground" for the surplus European production, and exceptionally low prices have been made on foreign glass for the United States. During the census year prices on stock sizes of European polished plate glass were 36 per cent lower for the United States than for England, while polished plate glass imported into the United States from France, averaged only about 50 per cent of the prices quoted in that country. The fact that the European surplus is placed in this market at a price below average cost, accounts for the heavy importations of polished plate glass. In face of this the domestic production in 1900 increased 85.5 per cent over that of 1890, evincing the steady acquisition of the home market for the domestic product. The production of polished plate glass in Europe in 1900 was given by Mr. Pitcairn in his testimony, in the following table, which shows the regulation of production by giving the productive capacity, and the actual output of the several factories:

NAMES OF COMPANIES.	Producing capacity, square feet.	Actual output, square feet.
Belgium:		
Auvelais	5,000,000	2,500,000
St. Roch	5,000,000	2,500,000
Moustier	3,300,000	1,600,000
Charleroi	2,900,000	1,400,000
Oignies	2,200,000	1,100,000
Courcelles	2,100,000	1,100,000
Roux	1,900,000	1,100,000
Floreffe	1,500,000	700,000
St. Gobain	800,000	400,000
Total, 9 factories	24,700,000	12,400,000
France:		
St. Gobain (4 factories)	7,500,000	3,800,000
Nord	3,700,000	1,800,000
Aniche	1,700,000	1,400,000
Boussoit	1,600,000	....
Assevent	800,000	800,000
Total, 8 factories	15,300,000	7,800,000
Germany:		
Stolberg and Mannheim	4,700,000	2,400,000
Eckamp	2,600,000	1,300,000
Schalke	2,000,000	1,000,000
Herzogenrath	1,900,000	1,000,000
Perz-Urbach	1,600,000	....
Frieden	1,200,000	600,000
Altwasser	700,000	300,000
Total, 8 factories	14,700,000	6,600,000
England:		
Pilkington Brothers	....	4,200,000
London and Manchester	....	2,300,000
British	....	900,000
Union	....	500,000
Total, 4 factories	[1] 7,900,000	7,900,000
Austria:		
Stankau	....	....
St. Gobain (Bilen)	....	....
Total, 2 factories	[1] 2,300,000	1,100,000
Russia:		
Nord	....	1,100,000
LaKash	....	700,000
Moscow	....	700,000
Midi	....	700,000
Total, 4 factories	[1] 3,200,000	3,200,000
Italy:		
Pisa (St. Gobain Company)	800,000	800,000
Grand total	68,900,000	39,800,000

[1] Producing capacity of each factory not reported separately.

The average wages paid in plate glass manufacture in the United States, during the year 1900, was estimated by Mr. Pitcairn to be about 200 per cent higher than in England, and about 300 per cent higher than in Belgium. In support of the latter claim he presented the following table, giving a comparison of American and

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[1] Report of the Industrial Commission, Vol. XIII, Trusts and Industrial Combinations, pages 225 to 242.

Belgian wages in the plate glass industry in 1900, the Belgian figures being compiled by the European representative of the Pittsburg Plate Glass Company:

	American rate per month, 30 days.	Belgian rate per month, 30 days.	Per cent American higher than Belgian.
Casting department:			
Foremen	$150.00	$96.50	56.0
Finishers	92.10	28.95	218.0
Melters	82.50	28.95	185.0
Skimmers	70.50	28.95	144.0
Stowers	70.50	28.95	144.0
Furnace cleaners	60.00	20.26	196.0
Kiln dressers	69.00	20.26	241.0
Casting and drawing	57.00	20.26	181.0
Cutters	86.40	20.26	326.0
Fillers	57.00	20.26	181.0
Bookers	57.00	20.26	181.0
Teamers	90.00	28.95	211.0
Kiln heaters	54.00	17.37	211.0
Grinding department:			
Foremen, day	121.20	28.95	318.0
Foremen, night	121.20	28.95	318.0
First grinders	82.80	23.16	257.0
Second grinders	68.40	23.16	195.0
First layers	99.00	23.16	327.0
Second layers	68.40	9.65	609.0
Canal men	52.20	20.26	158.0
Sandpit men	52.20	20.26	158.0
Matchers	71.00	20.26	250.0
Sand wheelers	52.20	20.26	158.0
Polishing department:			
Foremen, day	121.20	34.74	250.0
Foremen, night	121.20	34.74	250.0
First layers	111.60	23.16	382.0
Second layers	95.76	23.16	313.0
Third layers	90.00	23.16	289.0
Fourth layers	79.36	23.16	243.0
Mixers	78.12	17.37	350.0
Plaster wheelers	45.00	20.26	122.0
Matchers	72.00	20.26	255.0
Finishers	54.72	20.26	255.0
Bench boys	39.60	8.40	371.0
Warehouse:			
Foremen	150.00	40.00	275.0
Examiners	75.00	20.26	270.0
Cutters	67.50	20.26	233.0
Gang men	42.00	17.37	141.0
Blockers	45.00	17.37	159.0
Glass washers	37.50	17.37	116.0
Frames:			
Foremen	80.00	30.00	166.0
Examiners	60.00	28.95	108.0
Cutters	63.00	28.95	180.0
Gang men	60.00	20.24	196.0
Emery department:			
Washer	60.00	34.74	73.0
Washer, helper	50.00	17.37	187.0
Machinery department:			
Foremen	150.00	43.42	245.0
Engineers	63.00	25.50	147.0
Machinists	97.50	26.05	274.0
Carpenters	80.00	23.16	245.0
Bricklayers	90.00	23.16	289.0
Laborers	37.50	17.37	116.0
Pipe fitters	67.50	24.00	181.0
Blacksmith	79.50	24.12	230.0
Blacksmith, helper	45.00	17.37	159.0
Boiler men	60.00	25.50	135.0
Pot department:			
Foremen	90.00	28.95	211.0
Pot makers	70.50	28.95	144.0
Tampers	51.10	18.33	179.0
Gas producers:			
Foremen	85.00	28.95	194.0

About 66 per cent of the wage-earners in the plate-glass industry are native Americans. At the commencement of the industry in the United States it was necessary to get foreign workmen of experience, but the American is so much quicker to learn and is so much more steady, that he is preferred at present.

All of the improvement made in the manufacture of plate glass in this country during the last twenty-five years, aside from some details in the construction of machinery, has been for the purpose of increasing the size of the plates cast and improving the quality of the glass. Until very recently the same methods have been employed for casting, annealing, grinding, and polishing that have been in use for years. The liability of breakage during the finishing process that has attended the attempts to cast extremely large-sized plates, has resulted in a very great reduction in the average size of finished plates. The use of smaller pots, casting smaller and thinner plates for annealing in lehrs, and the adoption of new machinery for grinding and polishing, will undoubtedly result in a considerable decrease in the cost per square foot, and an increase in average size of finished plates, along with a material decrease in undesirable small sizes. A few large pots will be sufficient to supply the demand for extremely large sizes. In the manufacture of plate glass, the use of tank melting furnaces in connection with fining-pot furnaces, is likely to appear in the near future, and the size of the plates cast can then be regulated at will. The possibilities of such a process in connection with the continuous lehr, can scarcely be estimated. The introduction of the continuous lehr, has largely reduced the high ratio formerly existing between cost of construction and capacity of plate-glass factories, and has already resulted in the entrance of 6 new companies, into the field; 4 of the projected factories being in Pennsylvania, and 1 each in Michigan and Illinois.

Cathedral Glass.—There were 8,846,361 square feet of cathedral glass manufactured in 1900, valued at $567,252, compared with 2,773,824 square feet in 1890, valued at $279,407, an increase in quantity of 218.9 per cent, and in value of 103 per cent. The quality of this product has been brought to such perfection, that not only has the domestic market been largely supplied, but a good export trade has been developed with Germany, England, and France. The superiority of colors is increasing the demand for American cathedral or opalescent glass, from the leading foreign art centers. During the census year, 4 establishments in New York, Indiana, and Illinois reported export shipments direct from factories to the value of $13,432.

Wire Glass.—The manufacture of wire glass has been established in the United States on a firm basis during the last decade, and it is probable that this branch of the building glass industry will reach large proportions in the next few years. The quantity manufactured during the census year was 1,295,504 square feet, valued at $129,051. During the year several shipments were made to England, but exact details could not be secured. The industry is yet in its infancy. Wire glass, which is made by casting two sheets of glass with a wire net imbedded between them, has been recognized as a perfect fire retardent, especially adapted for partitions, fire shutters, skylights, and glazing in all places subject to the stress of fire or storm. It is manufactured by 4 establishments, 3 in Pennsylvania and 1 in Missouri.

Skylight Glass, etc.—Although no statistics of skylight glass are shown in the report on glass manufacture at the Eleventh Census, it can be stated that the manufacture of this product has considerably increased, reaching 3,679,694 square feet, valued at $165,086, in 1900.

Nearly all the plate-glass establishments make a specialty of its manufacture and 3 separate establishments produce it almost exclusively. The export trade in this glass is developing in an encouraging manner. The production of bent glass, for store fronts, show cases, etc., is becoming a prominent feature in connection with the production of plate glass, and there are several establishments, in addition, exclusively engaged in this business, which obtain the plate and window glass sheets from the factories and rework them, so are not included in this report. Of the 9 bending ovens included in this report, 5 are in Indiana and 4 in Pennsylvania. Within a few years the manufacture of glass tile has been introduced in this country on an extensive scale. One establishment is making it exclusively, while several others report it as a side line. Its use as a perfect sanitary wall, ceiling, and floor material gives promise of a large growth in this branch of glass manufacture.

Window Glass.—During the last decade a very great improvement has been made in the manufacture of window glass in the United States. This has been brought about by the introduction of the continuous tank furnace for melting the crude materials, in preference to the pot furnace which had been used exclusively since the start of the industry in this country in the early colonial days. Separate statistics of tank furnaces are not shown in the report on glass manufacture at the census of 1890, the tank prior to that date being largely an experiment in this country and in such limited use as to be deemed unworthy of special note at that census. At that time, however, the tank furnace was in successful use in Europe, especially in Belgium. The successful introduction of the tank furnace in the United States occurred at Jeannette, Pa., in 1888, and from 1890 it has been steadily displacing the pot furnace, until in 1900, 54.5 per cent of the capacity of active window-glass factories was contained in tank furnaces. The adoption of the tank has given the window-glass industry a permanency that was lacking when pot furnaces were used exclusively, and when the cost of construction was not great enough to prevent the ready abandonment of a plant for a more avantageous location. While the tank melting system is much more economical than the pot-furnace system, the cost of installation and other factory equipment is much greater. As a result the location of the tank factory is more apt to be selected with respect to permanency than is the case with the pot-furnace factory. The operation of tank furnaces by gas produced from coal has proven very satisfactory, both as to the quality of glass produced and cheapness of cost, indicating, in view of the failing supply of natural gas, the fuel likely soon to be in most general use.

The census year covered a portion of a period of great activity in window glass factory construction on a large and permanent scale, an activity possibly the greatest in the history of the industry. For several years prior to 1900 the establishments operating the largest proportion of the capacity had been getting into closer relations as to regulation of prices and factory operation, resulting in the more or less constant maintenance of an exceptionally good price list. These high prices attracted new capital into the field, and during the census year there were over 30 factories reported which were built within two years. At the close of the census year about 30 window-glass factories were either building or definitely planned, notwithstanding the fact that during the year a close combination of establishments, controlling about 65 per cent of the total capacity, had been effected and prices had been sharply cut to discourage further erection of factories.

In 1900 there were 100 establishments reported as manufacturing window glass, an increase of 19 per cent over the number reported in 1890, and 104.1 per cent over the number reported in 1880. Only 19 more melting furnaces were reported in 1900 than were reported in 1890, but, owing to the greater capacity of the tank, the gain in total pot capacity was 87 per cent. In 1900 there were 165 melting furnaces reported, with a total capacity of 2,429 pots; 146 furnaces of a total capacity of 1,299 pots in 1890; and 76 furnaces with a capacity of 665 pots in 1880; showing a gain since then of 117.1 per cent in number of furnaces, and 265.3 per cent in pot capacity. In 1900 the production was 4,341,282 boxes, valued at $10,879,355; in 1890, 3,768,884 boxes, valued at $9,058,802; and in 1880, 1,864,734 boxes, valued at $5,047,313. There is indicated an increase of 15.2 per cent for 1900 over 1890 in the number of boxes produced, and an increase of 20.1 per cent in the total value of products. Compared with 1880, the number of boxes produced in 1900 increased 132.8 per cent, and the total value of product increased 115.5 per cent. The average value of a box of window glass (50 square feet), according to the census returns in 1900 was $2.51; in 1890, $2.40; and in 1880, $2.71.

Of the 165 furnaces with a total capacity of 2,429 pots reported in 1900, 36 were tank furnaces of a total capacity of 1,327 pots and 129 were pot furnaces that contained 1,102 pots, a decrease from the number of pot furnaces and their total capacity as reported in 1890, of 11.6 per cent and 15.2 per cent, respectively. The great increase in capacity in 1900 over 1890 is confined entirely to the tank furnace, but the total production of 1900 compared with 1890 is not in keeping with this increase, owing to the greatly restricted operation of the factories in 1900, due to a "fire" averaging about six months as against a "fire" of ten months in 1890.

The distribution of the window glass capacity of active establishments in furnaces and pot capacity for

1900 is shown in the following statement, by states, in the order of their importance in capacity:

STATES.	Number of establishments.	Total number of furnaces.	Total pot capacity.	Number of tank furnaces.	Pot capacity.	Number of pot furnaces.	Number of pots.
United States.	100	165	2,429	36	1,327	129	1,102
Indiana	46	83	1,109	17	601	66	508
Pennsylvania	32	48	960	14	588	34	372
Ohio	6	10	128	2	66	8	62
New Jersey	4	6	96	3	72	3	24
New York	5	5	40	....	....	5	40
Maryland	2	5	28	....	....	5	28
West Virginia	2	3	22	....	....	3	22
Delaware	1	2	16	....	....	2	16
Massachusetts	1	2	18	....	....	2	18
Illinois	1	1	12	....	....	1	12

The bulk of the capacity of Indiana was in the counties of Grant, Blackford, Madison, Delaware, and Jay, located in the "gas belt." The capacity in Pennsylvania was largely confined to the Pittsburg district and McKean county. The Ohio plants were at Barnesville, Lancaster, Findlay, and Quaker City. The largest proportion of the capacity located in New Jersey was in Cumberland county. In New York there were 5 factories, 3 of which were in Ithaca, and 1 each in Canastota and Durhamville. The 2 factories in Maryland were located in Baltimore. There was 1 factory in Delaware, located at Wilmington. The only plant in Massachusetts, which was originally established in 1853, was at Berkshire. About 75 per cent of the total capacity was controlled from Pittsburg, Pa., the headquarters of the American Window Glass Company, and about ten other companies. The former owned 39 plants during the census year.

At the close of the census year there was either building or definitely planned new capacity amounting to over 600 pots. Over 100 of these new pots were located in West Virginia; nearly 250 in the district of McKean county, Pa.; about 75 in the coal fields of Illinois and Indiana; 75 in southern New Jersey; and about 75 in the "gas belt" of Indiana.

One feature of the manufacture during the census year was the notable scarcity of skilled workmen. This scarcity, together with the increase in the capacity of the plants, made the total capacity greatly exceed the supply of skilled workmen available for its operation in the four divisions of the work, gathering, blowing, flattening, and cutting. The supply of workmen was about sufficient to operate 2,000 pots, and owing to the strong organization of the men and their strict rules of admission, no considerable relief was possible. The result was that the skilled workmen dominated the industry as seldom before in the history of the trade. The wage scales were the highest in years, and most profitable inducements were offered in addition by manufacturers to secure men for their plants. Every window-glass factory in the country operates under union rules, and the wage scales are settled for each "fire" at conferences of committees representing the manufacturers and the union.

The 5 companies of a "miscellaneous" character shown in Table 13 were all cooperative and engaged in the manufacture of window glass, most of them having been established within the census year, and were financially supported by the union, which loaned money proportioned on the pot capacity of each plant. There were 2 establishments of this character reported in the pressed and blown ware and bottle and jar branch of the industry. It should be stated, in this connection, that there were in the glass industry in addition 9 incorporated establishments of a cooperative character operating under charters, which in all the tables are included under the head of corporations. They are in all essential particulars cooperative associations. This movement toward cooperation arose from the desire to secure more work during the year, the capacity of the factories having been for some time so much in excess of current consumption that the "run" of the factories had been getting less each year, averaging about six months where it was formerly ten. The past record of cooperation in the window glass industry of the United States has been unsatisfactory, all going well as long as the market conditions were good, but financial ruin usually appearing with any depression in the trade. The indications at present are very favorable for cooperative manufacture, and it will probably spread very rapidly in the industry in the near future. The greatest impetus it receives comes from the scarcity of workmen, which is leading manufacturers to organize companies in which a large share of the stock is held by the workmen, who are thus less likely to be tempted away by offers from other manufacturers.

Along with these quasi-cooperative companies many real cooperative companies, composed entirely of the men in the factory, are being established, especially among the Belgian workmen, who form a considerable proportion of the entire working force. The window-glass workers compose the only body of organized workmen in the building-glass manufacturing industry of this country, there being no organization among the plate-glass workers, from whom very little skill is required, machinery doing practically all the work in the factory.

The question of machinery is beginning to agitate the window-glass industry. So far, practically the entire process of manufacture requires skilled hand labor. The growing scarcity of workmen has stimulated efforts to perfect a mechanical process which will do the work now done by the gatherer and blower, and it is probable that eventually the smaller sizes of window glass will be successfully manufactured by machinery.

The average normal consumption of window glass in the United States is estimated at 5,400,000 boxes a year. A considerable portion of this demand is supplied by imported glass, chiefly from Belgium. This market has for years received the surplus window glass of that country, and any advance in American prices at once results in increased importations. The 50-foot box of single strength foreign glass weighs about sixty-two and one-half pounds, and the 50-foot box of double strength, about ninety-two and one-half pounds. In reducing the number of pounds of imported glass to boxes, the average weight of a box is placed at 70 pounds, and it is estimated that 25 per cent of the total glass imported is double strength. The total importation of window glass for the year ending June 30, 1900, was 51,343,339 pounds, or 733,476 boxes, valued at $1,555,924. There were imported 47,202,267 pounds in 1899; 38,908,992 pounds in 1898; 55,961,813 pounds in 1897; 53,182,301 pounds in 1896; 40,786,279 pounds in 1895; 52,437,068 pounds in 1894; 63,715,989 pounds in 1893; 72,682,127 pounds in 1892; 58,932,738 pounds in 1891; and 73,112,550 pounds in 1890. A strike, which was threatened in the Belgian factories at the close of 1900, caused a sharp decrease in the importation of window glass in 1901. The quantity imported during the year ending June 30, 1901, was 27,285,607 pounds.

The American window glass exported during the year ending June 30, 1900, was valued at $36,218, and in 1899 at $32,690. The domestic glass can not compete with the cheaper foreign glass, yet an increasing quantity of American window glass is going into Mexico, Canada, and the West Indies.

PRESSED AND BLOWN GLASS AND BOTTLES AND JARS.

Table 8 presents comparative statistics, by states, of the manufacture of pressed and blown glassware and bottles and jars, for 1890 and 1900.

TABLE 8.—COMPARATIVE STATISTICS, PRESSED AND BLOWN GLASS AND BOTTLES AND JARS, BY STATES: 1890 AND 1900.

STATES.	Year.	Number of establishments.	Capital.	SALARIED OFFICIALS, CLERKS, ETC.		AVERAGE NUMBER OF WAGE-EARNERS AND TOTAL WAGES.							
						Total.		Men, 16 years and over.		Women, 16 years and over.		Children, under 16 years.	
				Number.	Salaries.	Average number.	Wages.	Average number.	Wages.	Average number.	Wages.	Average number.	Wages.
United States	1900	231	$34,806,781	1,653	$1,980,393	40,916	$18,055,037	30,372	$15,901,620	3,509	$835,100	7,035	$1,318,317
	1890	194	22,613,274	[1]803	[1]894,449	32,910	13,726,058	24,431	12,472,386	1,818	311,652	6,661	942,020
Illinois	1900	5	2,143,658	71	106,600	3,291	1,615,786	2,594	1,491,391	148	28,456	549	95,939
	1890	8	1,353,978	28	40,210	2,291	937,515	1,747	871,420	20	3,860	524	62,235
Indiana	1900	59	5,694,974	285	375,122	9,103	3,974,228	7,002	3,557,923	634	129,808	1,467	286,497
	1890	10	659,463	27	30,305	1,480	554,610	1,134	514,903	180	21,951	166	17,756
Maryland	1900	5	479,534	28	36,576	657	275,354	477	249,756	54	8,673	126	16,925
	1890	5	371,205	10	9,768	762	358,783	448	317,005	24	6,864	290	34,914
Massachusetts	1900	4	255,949	38	27,660	375	179,329	331	169,891	19	4,392	25	5,046
	[2]1890	......	......	......	......	......	......	......	......	......	......	......	......
New Jersey	1900	22	5,178,672	309	278,634	5,153	2,299,500	4,136	2,115,061	170	32,726	847	151,713
	1890	22	2,776,971	130	116,331	4,606	2,009,916	3,553	1,888,694	43	8,405	1,011	112,817
New York	1900	20	1,908,799	106	124,538	2,328	1,140,973	1,975	1,075,992	73	17,831	280	47,150
	1890	21	1,507,891	45	52,400	2,505	1,054,934	1,869	952,903	92	17,025	544	85,006
Ohio	1900	21	3,412,379	174	226,459	4,069	1,691,378	3,028	1,468,952	405	96,017	636	126,409
	1890	37	2,979,987	163	171,519	5,134	2,037,452	3,752	1,836,233	538	74,227	844	126,992
Pennsylvania	1900	73	13,626,067	535	675,368	12,961	5,580,771	8,768	4,658,460	1,526	409,349	2,667	512,962
	1890	71	10,743,199	320	373,488	13,111	5,469,828	9,652	4,898,848	699	139,956	2,760	431,024
West Virginia	1900	14	1,265,624	80	93,016	1,886	734,676	1,258	603,817	468	103,748	160	27,111
	1890	7	825,313	34	46,946	1,371	511,079	970	446,349	190	32,632	211	32,098
All other states[3]	1900	8	841,125	27	36,420	1,093	563,042	803	510,377	12	4,100	278	48,565
	1890	13	1,395,267	46	53,482	1,650	791,941	1,306	746,031	33	6,732	311	39,178

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[1] Includes proprietors and firm members, with their salaries; number only reported in 1900, but not included in this table. (See Table 14.)

[2] Included in "all other states."

[3] Includes establishments distributed as follows: 1900—California, 1; Colorado, 1; Georgia, 1; Michigan, 1; Missouri, 1; Virginia, 2; Wisconsin, 1. 1890—California, 1; Colorado, 1; Georgia, 2; Kentucky, 2; Maryland, 2; Massachusetts, 2; Missouri, 2; Wisconsin, 1.

TABLE 8.—COMPARATIVE STATISTICS, PRESSED AND BLOWN GLASS AND BOTTLES AND JARS, BY STATES: 1890 AND 1900—Continued.

STATES.	Year.	Miscellaneous expenses.	MATERIALS USED.											
			Aggregate cost.	Glass sand.		Soda ash (carbonate of soda).		Salt cake (sulphate of soda).		Nitrate of soda.		Limestone.	
				Tons.	Cost.	Tons.	Cost.	Tons.	Cost.	Tons.	Cost.	Tons.	Cost.
United States	1900	$2,222,776	$12,051,925	403,754	$547,943	132,279	$1,921,405	468	$5,755	10,156	$311,675	30,741	$75,177
	1890	1,198,151	7,519,450	211,536	547,094	74,062	2,390,135	2,468	42,781	6,955	274,686	6,570	18,760
Illinois	1900	210,329	664,858	32,778	33,231	11,942	163,694	....	....	440	13,720	4,815	9,912
	1890	105,387	566,905	19,378	30,257	7,059	226,608	46	389	579	18,330	2,466	9,377
Indiana	1900	341,500	3,262,466	119,621	139,056	40,592	579,638	213	3,214	2,279	73,368	9,082	15,895
	1890	63,257	354,529	13,036	32,704	5,041	154,757	285	8,321	263	10,190	410	820
Maryland	1900	22,313	120,759	2,076	3,929	1,263	19,080	....	....	149	5,000	118	319
	1890	15,966	139,971	6,721	20,133	927	25,170	....	....	230	8,371	....	....
Massachusetts	1900	13,483	130,095	1,322	6,265	189	5,217	....	....	24	830	....	....
	[1]1890	....	....	....	....	....	....	....	....	....	....	....	....
New Jersey	1900	229,514	1,401,980	78,497	75,688	20,015	299,245	197	1,778	1,314	21,165	8,227	24,621
	1890	75,751	944,750	34,684	60,749	12,461	368,946	1,500	22,500	263	11,189	60	120
New York	1900	180,936	778,842	19,843	42,344	7,449	112,153	....	....	525	18,118	1,545	5,205
	1890	89,366	582,180	11,996	38,099	4,505	138,003	113	1,450	232	10,797	293	587
Ohio	1900	136,007	1,094,638	31,856	59,199	10,406	147,128	....	....	1,259	39,634	1,374	3,434
	1890	196,432	1,139,651	30,975	86,624	11,110	347,833	169	2,888	1,628	59,021	566	1,480
Pennsylvania	1900	1,000,711	3,738,422	96,683	157,462	33,192	471,130	58	763	3,789	126,058	3,399	8,730
	1890	519,331	3,058,596	78,154	234,671	27,270	923,540	215	3,579	3,277	138,658	2,055	5,626
West Virginia	1900	109,904	557,368	9,205	12,958	2,796	42,751	....	....	307	10,982	325	575
	1890	40,805	277,033	5,350	20,845	2,209	77,725	....	....	416	15,140	....	....
All other states[2]	1900	28,079	302,497	11,873	17,811	4,435	81,369	....	....	70	2,800	1,856	6,486
	1890	91,856	455,835	11,242	23,012	3,480	127,553	140	3,654	67	2,990	720	750

STATES.	Year.	MATERIALS USED—continued.											
		Lime.		Arsenic.		Manganese.		Litharge (red lead).		Potash or pearlash.		Fire clay and pot clay.	
		Cwt.	Cost.	Pounds.	Cost.	Pounds.	Cost.	Pounds.	Cost.	Pounds.	Cost.	Pounds.	Cost.
United States	1900	669,649	$135,586	1,028,131	$49,563	1,424,938	$55,177	8,350,585	$487,927	4,335,828	$183,143	8,640,317	$50,661
	1890	651,739	132,502	730,385	23,384	484,593	25,745	5,501,559	300,096	2,544,978	135,047	11,016,410	88,766
Illinois	1900	45,387	10,175	45,207	2,153	58,838	1,910	115,000	6,200	....	....	562,000	4,960
	1890	20,420	3,960	85,881	2,894	13,936	848	40,000	2,400	....	....	310,000	1,985
Indiana	1900	218,088	35,854	319,648	14,981	508,980	18,920	1,481,887	76,155	443,481	18,054	1,342,070	7,084
	1890	47,682	7,193	100,600	2,878	45,052	2,419	....	....	....	....	235,600	1,740
Maryland	1900	14,725	1,233	1,650	83	11,167	566	36,982	1,857	75,000	3,000	141,300	717
	1890	14,140	1,009	14,020	395	14,600	765	94,000	4,975	77,000	3,550	420,000	3,200
Massachusetts	1900	559	112	6,789	330	8,101	207	364,448	24,497	207,967	8,994	26,158	120
	[1]1890	....	....	....	....	....	....	....	....	....	....	....	....
New Jersey	1900	126,001	24,500	97,405	4,632	143,465	5,674	72,049	3,918	60,270	2,866	1,912,005	11,727
	1890	144,418	27,372	63,532	1,576	17,065	785	39,873	2,118	34,035	1,877	2,783,790	24,901
New York	1900	32,819	8,885	61,018	2,876	89,521	3,737	790,909	46,114	414,438	17,552	744,450	5,935
	1890	52,850	16,560	20,727	706	29,489	1,515	1,213,264	73,049	500,334	27,237	1,017,673	7,535
Ohio	1900	72,488	14,230	123,344	6,876	76,117	3,672	2,063,000	117,035	850,171	34,129	946,000	2,306
	1890	84,032	16,708	179,406	5,772	111,181	5,907	786,991	35,810	335,216	16,985	1,240,250	10,677
Pennsylvania	1900	127,790	34,027	285,267	13,372	437,181	16,831	3,141,027	191,568	1,932,699	81,991	2,560,394	15,990
	1890	201,822	42,744	164,114	6,117	212,410	11,742	3,086,681	167,499	1,474,093	77,440	3,498,733	27,027
West Virginia	1900	11,228	2,820	69,303	3,295	58,944	2,239	285,283	20,583	351,802	16,557	134,940	1,437
	1890	11,286	3,237	89,822	2,606	16,450	985	100,000	5,800	50,000	3,500	662,550	3,245
All other states[2]	1900	20,564	3,750	18,500	965	32,624	1,421	....	....	....	....	271,000	385
	1890	75,089	13,719	12,283	440	24,410	779	140,750	8,445	74,300	4,458	847,814	8,456

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[1] Included in "all other states."

[2] Includes establishments distributed as follows: 1900—California, 1; Colorado, 1; Georgia, 1; Michigan, 1; Missouri, 1; Virginia, 2; Wisconsin, 1. 1890—California, 1; Colorado, 1; Georgia, 2; Kentucky, 2; Maryland, 2; Massachusetts, 2; Missouri, 2; Wisconsin, 1.

Table 8.—COMPARATIVE STATISTICS, PRESSED AND BLOWN GLASS AND BOTTLES AND JARS, BY STATES: 1890 AND 1900—Continued.

STATES.	Year.	MATERIALS USED—continued.										PRODUCT.
		Pots (not including those made at works).		Fuel.							All other materials, cost.	Total value.
				Total cost.	Natural gas, cost.	Oil.		Coal.		All other fuel, cost.		
		Number.	Cost.			Gallons.	Cost.	Tons.	Cost.			
United States..........	1900	5,111	$280,086	$2,084,124	$823,924	11,967,202	$385,997	485,852	$738,218	$135,985	$5,863,703	$39,443,478
	1890	5,419	306,441	1,349,919	452,124	1,576,470	60,939	308,945	684,739	152,117	1,884,094	27,122,708
Illinois	1900	284	16,930	154,020	....	1,663,301	41,084	113,475	94,232	18,704	247,953	2,810,398
	1890	398	30,448	112,027	....	492,072	23,300	54,781	66,403	22,324	127,382	1,945,790
Indiana	1900	947	56,849	159,924	157,963	135	37	520	1,478	446	2,063,474	9,045,935
	1890	254	14,170	7,908	....	....	....	4,900	6,258	1,650	111,429	1,163,664
Maryland....................	1900	164	7,286	33,416	....	148,396	6,234	12,315	22,089	5,093	44,273	454,633
	1890	240	10,970	31,360	....	....	....	12,756	26,974	4,386	30,073	674,900
Massachusets................	1900	110	5,175	30,287	....	371,867	15,619	3,416	12,782	1,886	48,061	402,258
	1890[1]	....	....	....	....	....	....	....	....	....	....	....
New Jersey..................	1900	301	11,217	415,485	....	4,964,767	155,257	92,520	194,457	65,771	499,464	4,819,811
	1890	359	12,279	265,210	....	....	....	71,486	205,175	60,035	145,128	3,901,982
New York	1900	143	7,125	184,417	9,190	1,293,521	45,603	48,190	121,302	8,322	324,381	2,410,188
	1890	150	6,005	151,650	....	55,944	2,664	39,707	124,027	24,959	108,987	2,000,842
Ohio........................	1900	863	52,861	213,633	99,404	1,250,637	31,874	48,816	78,138	4,217	400,501	3,875,661
	1890	1,152	71,172	96,167	64,579	33,054	1,575	33,565	27,972	2,041	382,607	4,073,385
Pennsylvania	1900	2,095	110,124	711,295	481,833	938,873	44,548	139,116	159,503	25,411	1,799,081	12,797,585
	1890	2,311	132,402	483,027	336,545	46,200	1,650	55,128	124,716	20,116	804,524	10,772,213
West Virginia	1900	184	11,199	77,423	75,534	18,650	585	1,271	1,304	....	354,549	1,770,553
	1890	170	12,222	54,885	51,000	....	....	3,160	2,085	1,800	76,843	945,234
All other states[2]...........	1900	20	1,320	104,224	....	1,317,055	45,156	26,213	52,933	6,135	81,966	1,056,456
	1890	385	16,773	147,685	....	949,200	31,750	33,462	101,129	14,806	97,121	1,644,698

STATES.	Year.	EQUIPMENT AND CHARACTERISTICS OF WORKS.															
		Furnaces, number.	Pots, number.	Tanks.[3]		Clay-grinding mills, number.	Grinding machines, number.	Shops, number.	Glory holes, number.	Annealing ovens, number.	Lehrs, number.	Presses or presses mechanical, number.	Finishing machines, number.	Crimping machines, number.	Grinding and engraving machines, number.	Horses and mules, number.	Wagons, carts, and drays, number.
				Number.	Pot capacity.												
United States..........	1900	258	2,811	305	3,404	8	20	3,978	1,419	1,540	1,025	964	140	494	137	317	314
	1890	369	2,908	....	....	78	63	2,894	880	1,600	599	801	91	233	798	370	297
Illinois	1900	9	117	18	306	....	....	427	146	289	31	13	2	1	3	23	24
	1890	18	140	....	....	3	4	115	48	263	11	2	....	....	1	24	12
Indiana	1900	43	529	99	999	1	1	1,397	351	161	321	201	33	169	29	7	20
	1890	21	116	....	....	....	4	77	32	45	43	8	....	....	4	7	6
Maryland	1900	7	79	1	6	....	....	67	24	21	18	7	....	....	4	8	11
	1890	7	77	....	....	1	....	113	15	15	20	4	50	15	17	5	4
Massachusetts	1900	5	47	1	90	....	....	38	16	15	12	9	....	5	....	7	8
	1890[1]	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
New Jersey..................	1900	30	231	48	697	1	4	718	301	266	95	55	1	....	22	92	104
	1890	56	281	....	....	13	12	323	199	352	50	17	....	....	47	95	79
New York	1900	20	182	22	282	....	....	312	66	126	55	49	2	32	9	44	44
	1890	39	259	....	....	15	7	236	41	104	47	30	....	....	23	49	46
Ohio........................	1900	29	377	16	171	2	....	613	93	121	102	125	59	35	5	15	6
	1890	55	521	....	....	10	13	441	130	122	142	243	21	57	258	21	2
Pennsylvauia	1900	102	1,103	64	572	4	15	144	351	395	323	444	42	252	54	87	74
	1890	136	1,232	....	....	26	14	1,316	370	543	241	403	20	151	303	120	87
West Virginia	1900	12	134	20	90	....	....	158	28	18	59	60	1	....	10	5	5
	1890	17	144	....	....	3	2	104	24	18	33	85	....	10	60	12	12
All other states[2]...........	1900	1	12	16	191	....	....	104	43	128	9	1	....	....	1	29	18
	1890	20	138	....	....	7	7	169	21	138	12	9	....	....	85	37	29

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[1] Included in "all other states."

[2] Includes establishments distributed as follows: 1900—California, 1; Colorado, 1; Georgia, 1; Michigan, 1; Missouri, 1; Virginia, 2; Wisconsin, 1. 1890—California, 1; Colorado, 1; Georgia, 2; Kentucky, 2; Maryland, 2; Massachusetts, 2; Missouri, 2; Wisconsin, 1.

[3] Not reported in 1890.

Table 8 shows that there were 231 establishments engaged in the manufacture of pressed and blown ware and bottles and jars during the census year, as compared with 194 in 1890, an increase of 19.1 per cent. Of the number in operation in the census year, 84 manufactured pressed and blown flint and lime glassware, such as tableware, jellies, common tumblers, goblets, lamps, chimneys, lantern globes, shades, globes, gas and electric lighting goods, blown tumblers, stem ware, bar ware, opal ware, cut glass, etc. The remaining 147 establishments manufactured bottles and jars in every variety of flint, green, and amber glass. As several establishments had products in both of the above classes and a fair division of their business in each branch could not be made, it was necessary to consolidate the reports of the two divisions. The total value of pressed and blown ware and bottles and jars in 1900 was 45.4 per cent in excess of that reported in 1890, the totals being $39,443,478 and $27,122,708, respectively. Of the total value of pressed and blown ware and bottles and jars in 1900, 55.9 per cent was the value of bottles and jars and 44.1 per cent that of pressed and blown ware, as shown in Table 14. Of the total value of all glass manufactured during the census year, the value of bottles and jars was 38.3 per cent and that of pressed and blown ware, 30.2 per cent.

Pennsylvania ranks first with 32.4 per cent of the total value of products in the manufacture of pressed and blown ware and bottles and jars in 1900. It was first also in 1890, with 39.7 per cent of the total value of products. Indiana, owing to its natural gas, ranked second in 1900, with 22.9 per cent, and sixth in 1890, with 4.3 per cent of the value of products. New Jersey was third in both 1900 and 1890, with 12.2 and 14.4 per cent of the value of products, respectively. Ohio was in fourth place in 1900, with 9.8 pei cent of the value of products, but in 1890 was second, by reason of its gas fields, with 15 per cent of the total value of products. Illinois in 1900 retained the rank held in 1890, fifth place, while New York dropped from fourth place in 1890 to sixth place in 1900, on account of the western movement of the factories during the last decade. Reference to Table 14 shows that Pennsylvania leads in the production of pressed and blown ware, reporting 49.5 per cent of the total value of products, while Ohio and Indiana, the next two in rank, report 16 per cent and 15.8 per cent, respectively. West Virginia and New York report 8.1 per cent and 6.9 per cent, respectively. Indiana was the leading state in 1900 in the manufacture of bottles and jars, showing 29.2 per cent of the total value of products; New Jersey, 20.5 per cent; Pennsylvania, 19.2 per cent; Illinois, 12.4 per cent; New York, 5.5 per cent; and Ohio, 4.9 per cent.

The number of establishments reported in 1900 as engaged in the manufacture of pressed and blown lime and flint glassware and bottles and jars was 65.1 per cent of the total number of glass-manufacturing establishments of all kinds. In 1890 they were 66 per cent of the total number. The amount of capital invested in this branch of the industry in 1900 showed an increase of 53.9 per cent over 1890. The average number of wage-earners employed in 1900 was 24.3 per cent greater than in 1890, while the total amount of wages paid showed an increase of 31.5 per cent over 1890. There was an increase of 24.3 per cent in the average number of men employed and 27.5 per cent in their wages; the number of women increased 93 per cent and their wages 168 per cent. The increase in the number of women employed was due largely to the development of the manufacture of decorated ware during the last decade, giving employment to many young women. The average number of boys (practically all children in glass factories are boys) increased only 5.6 per cent and their wages 39.9 per cent. The small increase in the number of boys between 1890 and 1900 was due largely to the strict enforcement of the truant school laws in the principal glass-manufacturing states, which caused a great scarcity of boys, particularly in the bottle factories, and also largely accounted for the increase of 39.9 per cent in wages. The difficulty of obtaining boys is confined to establishments making pressed and blown ware and bottles and jars, practically none being employed in building-glass factories. Their chief duty is to carry the ware from the blower or presser to the annealing department and to attend to the molds, important items in the operation of the factory, so that their absence causes a general curtailment of production.

One result of this state of affairs was a general effort to invent means for dispensing with boy labor. One apparently practicable plan to this end is the use of a portable sheet-iron box or oven, capable of being kept at a satisfactory temperature, into which the ware is placed as it comes from the mold. When the "iron boy" is filled, two laborers carry it to the annealing department and unload the ware into the annealing ovens or lehrs. In this way, it is claimed, several laborers can handle the production of the factory with as much speed and at less cost than when boys are employed. As a result of a recent scarcity, the plan of employing young women or girls was agitated, but this aroused such a storm of indignant protest from all workers that it was never put into operation.

The total cost of materials used in 1900 in pressed and blown ware and bottle and jar manufacture was 60.3 per cent greater than in 1890. The total cost of fuel reported in 1900 is 54.4 per cent in excess of the total reported in 1890, the reported value of natural gas used being 82.2 per cent greater; however, a number of establishments owning their source of supply in 1890 and 1900 made practically no report of cost for gas fuel, but charged the expense against cost of maintenance. A remarkable increase in the use of oil as a fuel is shown, the number of gallons used being 659.1

per cent greater in 1900 than in 1890, while the cost increased 533.4 per cent. The average cost per gallon in 1900 was 3.2 cents, as compared with 3.9 cents in 1890. Ninety-four and three-tenths per cent of the quantity of fuel oil reported as used in glass manufacture in 1900 was used by the factories which manufactured pressed and blown ware and bottles and jars. A large number of small tanks operated with fuel oil, and a large quantity was used in the glory holes, the number of which in the entire industry in 1900 was 61.3 per cent in excess of the number reported in 1890. There was an increase of 57.3 per cent in the quantity of coal used and an increase of only 7.8 per cent in the cost. The average cost per ton in 1900 was $1.52, as compared with $2 22 per ton in 1890. The increased use of the tank furnace, with coal-gas producers using a cheap grade of slack coal, was the cause in a large measure of this decided decline in the average cost per ton.

The total number of furnaces in this branch of glass manufacture in 1900 shows an increase of 52.6 per cent over the number reported in 1890, and the total pot capacity increased 113.7 per cent; of this capacity, 54.8 per cent is contained in continuous and day or intermittent tank furnaces, which were of insignificant number prior to 1890. The use of the continuous tank in this branch of the industry is confined almost entirely to the bottle and jar trade, only 10 being reported in the pressed and blown ware establishments. Bottles of all kinds are being made from the continuous tank, and the bulk of the fruit jar and beer bottle production is made in this manner. Within the last few years flint glass for bottles and jars of such a fair quality has been made in the tank furnace that, taken in connection with the cheaper cost of production and the increased output, flint glass made in tanks for bottleware is rapidly superseding the pot-made flint glass. The adoption of the tank for manufacturing flint-glass bottles has been so general that at the close of the census year the flint-glass bottle blowers, numbering over 2,000, who since 1878 had been joined in a trades union with workmen in 13 other branches of the flint-glass trade, were preparing to leave that association and join with the green bottle blowers' union. This step was finally taken one year later by a large number.

A small decrease in the total number of annealing ovens in use in pressed and blown ware and bottle and jar manufacture was reported in 1900 as compared with 1890, and at the same time the number of annealing lehrs increased 71.1 per cent, showing that the annealing oven is being displaced by the faster and more economical lehr. The principle of the oven method of annealing is the gradual reduction of the heat, while the lehr method is based on the principle of gradually withdrawing the glass from the heat. The new method lends itself more readily to scientific exactness in securing results and, being continuous in operation, makes it possible to handle the increased output of the factory in much less time and at smaller cost.

The manufacture of bottles and jars is the oldest branch of the glass industry in this country, the first glass factory, at Jamestown, Va., in 1608, probably operating exclusively on bottles. It has always formed a prominent part of the industry and in the last decade has made greater progress than any other branch of glass manufacture. The tank furnace, machinery, and improved factory equipments and facilities have resulted in a large increase in the value of products.

Specialization is the prevailing characteristic. A few years ago it was customary for each establishment to manufacture a large variety of ware, and the workman as a rule was accustomed to make a little of everything; but it is now the tendency to restrict the output of the factory to a particular article, and the workman is an expert in one branch of his trade, the general workman having given way to the specialist capable of maintaining the highest speed. This specializing tendency is particularly marked in the manufacture of fruit jars and beer bottles. For years bottles were made in connection with window glass from the same furnace. A survival of this is present in the trade to-day with 5 establishments, manufacturing both window glass and bottles; separate furnaces are used, however.

In no branch of the glass industry has the use of machinery made so great a change as in bottle and jar manufacture during the last decade, and especially the last four years. This applies particularly to the manufacture of fruit jars and wide-mouth ware, such as vaseline jars, jam jars, etc. Prior to 1890 the manufacture of machine-made wide-mouth bottles or jars was largely experimental, and practically no fruit jars had been made by machinery. Since that date the enormous production of small wide-mouth articles, such as vaseline jars, of which one establishment in New York uses 10,000,000 yearly, has been made almost entirely by machines, while fully 90 per cent of the fruit jars are machine-made, and it is only a question of a very short time until the fruit jar will be made exclusively in this manner. The results so far attained indicate that in a few years the bulk of the entire wide-mouth bottle production will be made by machinery.

Prior to the use of machinery, the method of manufacture of wide-mouth ware was to gather the glass from the furnace on a blowpipe, forming it to a suitable preliminary shape in a block or on a marver, and then inserting the glass in a mold and blowing to the desired form. After separating the glass from the blowpipe, a ragged edge of superfluous glass remained attached to the neck of the article, which had to be chipped and ground off to make the product salable. The manufacture of the Mason fruit jar, which since it was patented, in 1858, has constituted 90 per cent of the fruit jar production, has been most completely revolutionized by machinery. Prior to 1896 the glass was gathered from the furnace upon a blowpipe, was then blocked or rolled in a hollow block to get a preliminary shape, then swung by the blower and blown up, rolled on a flat slab or marver, and again blown until it was just large enough to admit of being inserted in the blow mold. The mass of glass was then put into the mold and blown up, so as to completely fill the mold and form a collar of surplus glass extending above the top of the jar about an inch and a quarter. Above this collar was the remainder of a thin bubble into which the blower had formed the glass outside the mold so as to separate it from the blowpipe. This collar and bubble constituted the "blow-over," which had to be removed before the jar was marketable. After being annealed the jar was taken by a workman who, with a file, chipped off most of the "blow-over" and then filed it down as smooth as possible, leaving about one-sixteenth of an inch of the collar remaining, which was finally removed from the jar by the grinding machine. Then the jar had to receive a thorough washing by hand to remove all particles of broken glass and sand resulting from the chipping and grinding. After being carefully dried, the jar was at last ready to pack. The speed with which it was necessary to perform the operations of chipping, grinding, washing, and drying made the risk of breakage great, being estimated at the rate of from 8 to 20 per cent.

By the use of machinery the costly "blow-over" is avoided by first pressing the neck of the jar to finished form and then forming the body of the jar by blowing, so that when the jar leaves the blow mold to be annealed it is, so far as form is concerned, a marketable article. The process patented July 11, 1882, by Philip Arbogast, of Pittsburg, Pa., has been the basis for all machinery used in the manufacture of jars and wide-mouth bottles. He employed two separate molds, a press mold and a blow mold. Sufficient glass to make the desired article was taken from the furnace on a solid rod or punty and dropped into the press mold, the required quantity being separated from the mass on the punty by shears in the hands of a workman. A lever operated by the workman then brought down a plunger into the mold, pressing the mouth or neck of the article to finished form and pressing a wind cavity in the dependent mass of glass to aid in the blowing operation. The plunger being withdrawn, the mold was opened, and the ring inclosing the pressed neck with the dependent mass of glass was carried to the blow mold and inserted, after which the body of the article was blown up to the desired form. From 1884 to 1893 this process was followed in a small way on large candy and druggists' jars, wide-mouth bottles, vaseline and jam jars, milk jars, and tableware, such as bowls, pitchers, sugars, and creams, but the principal products were large drug and candy jars, which, after having the necks pressed to the finished form, were taken out of the press mold and greatly increased in size by manipulation of the blower before being placed in the blow mold. In 1893 the process began to be more extensively used on vaseline jars.

The idea of dispensing with the manual operation of transferring the glass from one mold to another was patented in England in 1886, both molds being combined into one by the use of sliding parts. About the same time the idea of placing a series of molds on a revolving table was also patented in that country, and patents were granted in the United States in 1889 on both devices, but they were never put into practical use. In 1896 an American combined the consolidated mold and rotary table. On a rotating table is placed a series of five separate, duplicate, double molds, each mold containing an outer blow section having a ring integral with it in which the neck of the article is pressed, and a telescopic press section rising within the blow section and receiving the glass, forming, with the neck of the blow section, a press mold. The glass is dropped into the combined mold when in this press mold position, and the table rotated, bringing the mold under the plunger, which enters it and presses the neck, and wind cavity into the dependent mass of glass. The plunger is withdrawn, and another rotation of the table brings the mold under the blow stem, the telescopic press section of the combined mold having dropped in the meantime, exposing the glass blank within the blow section. The bottom plate is inserted and the air admitted to expand the glass blank to the form of the blow mold. The next rotation of the table brings the mold to where it is opened by a boy, and the finished article is taken out and removed to the annealing oven.

All of the above operations are performed simultaneously, a finished article being produced at each rotation of the table. On such a machine the first commercially successful machine-made Mason fruit jar was manufactured in July, 1896, at the plant of the Atlas Glass Company at Washington, Pa. The numerons jar and wide-mouth bottle machines now in use have either separate blow and press molds arranged near together on a revolving table so that the shifting of the glass from one to the other is almost instantaneous, or have the molds combined in one. In all, the basic principle is the pressing of the finished neck and the subsequent blowing of the body. Compressed air for blowing and electricity for motive power have added much to the speed of the operation. The machine has a much greater productive capacity than is possible by the old hand method of blowing, and has reduced the cost of manufacture more than a third. Loss by breakage has been reduced to a minimum, while the finish of the ware is far superior to that of the handmade article.

So far, the manufacture of narrow neck bottle ware by machinery is not beyond the experimental stage in this country, although commercial success is claimed in Germany and Russia. The claim is made by the best authorities that the manufacture of narrow neck bottles by machinery will soon be perfected and become as general as the mechanical production of wide-mouth ware. The method employed at present in making narrow neck bottles is to gather a suitable amount of glass from the furnace on the blowpipe, to roll it on a marver or turn in a block, to swing and blow and again roll on the marver to give it the proper form for insertion in the mold, where it is blown, forming the body and neck of the bottle. The article is then taken from the mold and carried to the glory hole, where the top of the neck is reheated and the ring or lip of the bottle neck is formed by the workman with a finishing tool, after which the bottle is ready for annealing. The greatest advance made so far in the mechanical production of narrow neck ware has been in the finishing process, although the finishing machine, as yet, is used to but a limited extent.

The number of fruit jars reported in 1900 was 789,298 gross of different sizes—pints, quarts, and half gallons—valued at $2,935,036. It is estimated that about 90 per cent of these were the Mason patent jar, which has a screw threaded neck for a metallic cap which presses down a rubber band on the shoulder of the jar, making a perfect seal. The other jars manufactured were more expensive kinds with special sealing devices, of which that with an all-glass top was the favorite. There were 34 establishments engaged in the manufacture of fruit jars during the census year, 6 of which made that class of ware exclusively. The largest fruit jar plant in the world, with a daily capacity of 240,000 jars, all machine-made, is in Indiana. Comparison with the statistics of the last two censuses shows a great development in this branch of the industry, caused principally by the introduction of the continuous tank in the last decade and the adoption of machinery within the last four years. In 1890, 268,978 gross of fruit jars were reported, valued at $1,390,430. There was an increase of 193.4 per cent in the number manufactured in 1900 over 1890. The average value per gross in 1900 was $3.72 as compared with $5.17 in 1890, a decrease of 28 per cent in the value per gross.

The statistics of fruit jars manufactured at the census of 1880 are incomplete, yet the total of 148,271 gross reported for Pennsylvania, New York, and New Jersey probably comprised very nearly the production of the entire country. The increase in the quantity manufactured in 1900 over 1880 was 432.3 per cent. No fruit jars were reported in Indiana in 1880; but this state headed the list in 1890 with 83,270 gross, valued at $440,657, or 31 per cent of the total production, and also in 1900 with 559,549 gross, valued at $2,106,250, or 70.9 per cent of the total production. Pennsylvania, which was first in 1880 in the manufacture of fruit jars, 67,770 gross having been reported, was third in 1890, with a product of 47,250 gross, valued at $233,125, and second in 1900, with 115,000 gross, valued at $436,104. Ohio was second in the manufacture of fruit jars in 1890 by reason of the discovery of natural gas, 60,726 gross, valued at $296,065, having been reported, while in 1900 the number had dwindled to 2,000 gross of a special kind, valued at $8,000. In 1880 there were 51,749 gross reported as manufactured in New Jersey; in 1890, 33,406 gross, valued at $181,410; and in 1900 this state reached third place, with 61,871 gross, valued at $192,467. In New York there were 28,752 gross manufactured in 1880; in 1890 there were reported 9,500 gross, valued at $55,000; and 31,235 gross, valued at $128,965, in 1900, an increase in the number manufactured of 228.8 per cent over 1890. The statistics for Illinois show a large decrease in fruit jars manufactured since 1890, the number reported in 1900 being 1,500 gross, valued at $9,000, compared with 20,750 gross in 1890, valued at $103,798. In West Virginia, from which no fruit jars were reported in either 1880 or 1890, there were manufactured 14,643 gross, valued at $43,750, in 1900.

At the close of the census year large quantities of fruit jars, roughly estimated at 340,000 gross, were being held in stock and were controlled by a selling agency formed among the principal manufacturers. A large portion of this stock was held by one firm, which had thousands of jars stacked in an open field. This stock had accumulated for several years and was held in prospect of the approaching failure of the natural gas and the consequent advance in prices.

The manufacture of prescription bottles, vials, and druggists' ware was carried on by 77 establishments in 1900, several of the largest factories in the country being operated almost exclusively on this class of goods. The value of these products in 1900 was 21.5 per cent of the total value of all bottles and jars manufactured. The statistics reported in 1890 of bottles and jars manufactured are of no value for comparative purposes, as they were not complete. However, the total number of bottles reported in that year, exclusive of beer bottles, was 2,170,961 gross. The average value per gross of this class of ware in 1900 was $1.92, which was a considerable reduction from the value per gross in 1890. This was due to the increased quantity of ware produced from the continuous tank furnace. Of the total quantity of this class of ware manufactured in the United States in 1900, 30.2 per cent was made in New Jersey, constituting 28 per cent of the total value, the average value per gross for the state being $1.79. Indiana ranked second, with 25.7 per cent of the total quantity and 25.4 per cent of the total value of the products, the average value per gross for the state being $1.90. Pennsylvania, by reason of much of the product of that state being of higher grade, closely followed Indiana in the value of the products, producing 25.4 per cent of the total value and 22.7 per cent of the total quantity, the average value per gross being $2.12. In Illinois 11 per cent of the total quantity and 8.7 per cent of the total value was manufactured, the average value per gross for the state being $1.52. A large part of the southern trade was supplied by that state. The manufacture of homeopathic vials was carried on by 4 glass making establishments. These vials were also made during the census year in a large number of small shops where the tubing is bought and reworked. No account of these shops is taken in this report. The American prescription bottle has no superior in form and finish, and is far in advance of the ware manufactured abroad. Export shipments of this class of ware direct from factories in 1900 were reported to Canada, Australia, South and Central America, Cuba, Great Britain, France, Africa, East Indies, China, and Japan, of a total value of $93,094, which represented only a portion of the actual exportation, as the most of the trade was done through exporting houses.

The manufacture of beer, soda, and mineral water bottles in 1900 was reported by 75 establishments in 15 states, the total value of which was $5,075,068, or 23.4 per cent of the total value of all bottles and jars manufactured. Several establishments were employed almost exclusively in the manufacture of beer and soda bottles, the bulk of the trade being done by them. Plans were being prepared at the close of the census year for 6 new establishments to manufacture beer and soda bottles exclusively, while increases of capacity among established plants were general, nearly all being in the line of continuous tanks. Demand for ware in the census year was extraordinary, the home consumption being unusually large, while large quantities of bottles filled with beer were shipped to Cuba and the far East. The export trade in beer and soda bottles with Mexico reached its highest development during the census year, direct factory shipments aggregating 21,147 gross, valued at $66,333, being reported for that country. The manufacture of mineral water bottles largely increased during the decade and was unusually large during the census year. By far the largest part of the production in this branch of the industry was made from the continuous tank furnace.

The general use of the tank and better facilities for the maintenance of a high rate of speed by the workmen have resulted in a great increase in the average factory output within the last ten years, yet consumption at the close of the census year was demanding still greater capacity, and prices were at a high point. In 1890 a production of 204,948 gross of beer bottles was reported, the figures probably not being complete, but showing nearly all of the country's production in that year; this was exceeded in 1900 by Illinois alone, with 4 establishments reporting. As in 1890, Illinois in 1900 was first in the manufacture of beer, soda, and mineral water bottles, with 26.3 per cent of the total value and 30.1 per cent of the total quantity manufactured in the United States. Pennsylvania ranked second in value of products, with 17.8 per cent of the total, but the quantity manufactured was only 10.9 per cent of the total quantity. Establishments in Ohio reported 12.6 per cent of the total value and 16.2 per cent of the total number of gross, while the production in New York constituted 9.9 per cent of the total quantity and 9.3 per cent of the total value. A large percentage of the total value and quantity was reported under the head of "all other states," which came chiefly from Wisconsin and Missouri, each having a large establishment devoted to the exclusive manufacture of this class of ware. California, Colorado, Georgia, Michigan, and Virginia were the other states included under this head. New Jersey, with a production slightly less in quantity, led Indiana in the total value of beer, soda, and mineral water bottles manufactured. Following Indiana in this class of ware were Maryland, West Virginia, and Massachusetts, in the order named.

There were 81 establishments engaged in the manufacture of flasks and liquor bottles in 1900, the total value of the products being 11.1 per cent of the total value of bottles and jars manufactured, Indiana heading the list with 50.2 per cent of the total value and 61.4 per cent of the total quantity. There were several small establishments equipped with tank furnaces in this state operating exclusively on flasks with very cheap gas fuel, and cheap unorganized labor, that created considerable demoralization in prices and in the trade of the old establishments. To counteract this, the American Flint Glass Workers' Union, to which the organized flask workers belong, at the close of the census year was erecting a tank factory in Indiana to be operated exclusively on flasks, which were to be sold at prices to compete with these new firms, and thus to either force them out of the business or cause them to maintain prices and working conditions equal to those in force among organized manufacturers. This movement is unique in the history of trades unions, and is based on the principle that there is greater economy and efficiency in direct business competition than in the old method of taking men out on strike and supporting them on a relief roll. Pennsylvania was next to Indiana in the manufacture of flasks and liquor bottles, 14.5 per cent of the total quantity and 18.6 per cent of the total value being manufactured in that state. Liquor bottles and flasks were also manufactured in California, Georgia, Illinois, Maryland, Massachusetts, Michigan, New Jersey, New York, Ohio, Virginia, West Virginia, and Wisconsin.

The manufacture of milk jars or bottles is practically a development of the last decade. The demand has steadily increased, causing a corresponding increase in the furnace capacity used in the manufacture of this class of ware. The manufacture of milk jars was reported in 1900 by 31 establishments, 13 of which were located in Pennsylvania. The total value of milk jars of all sizes manufactured in 1900 was 3.4 per cent of the total value of all bottles and jars manufactured. The average value per gross for the United States was

$4.99. The mechanical production of milk jars is commercially possible, and it is probable that a large part of the product will be made by machinery during the present decade. The manufacture of milk jars was one of the most rapidly expanding branches of the glass trade at the close of the census year, the overwhelming merits of such a package for milk becoming more widely recognized and the demand steadily increasing. Pennsylvania led the productive list, with 55.1 per cent of the total quantity and 59.6 per cent of the total value. The percentages of the total quantity and total value of milk jars manufactured in the other states in 1900, are as follows: New Jersey, 13.5 per cent of the quantity and 14.7 per cent of the value; Indiana, 13.4 per cent of the quantity and 7.6 per cent of the value; Illinois, 5.1 per cent of both quantity and value; New York, 4.7 per cent of the quantity and 4.6 per cent of the value; Ohio, 4.1 per cent of both quantity and value; West Virginia, 3.1 per cent of the quantity and 3.2 per cent of the value.

The manufacture of bottles for patent and proprietary medicines is largely confined to the states of New Jersey, Illinois, and Indiana, although 47 establishments in 8 states were reported as engaged in the manufacture of such products. The value of bottles for patent and proprietary medicines manufactured in 1900 was 12 per cent of the value of bottles and jars of all kinds reported. The combined production of New Jersey, Illinois, and Indiana was 88.6 per cent of the total quantity for the United States. Bottles of this kind are made of a cheaper grade than prescription bottles and are used in steadily increasing quantities, a large quantity being exported filled. New Jersey for a long period has been first in the manufacture of this class of ware, and in 1900 there was reported from that state 46.4 per cent of the total quantity and 53.7 per cent of the total value for the United States. From Illinois was reported 23.4 per cent of the total quantity and 19 per cent of the total value; and from Indiana 18.9 per cent of the total quantity and 14.5 per cent of the total value. Bottles for patent and proprietary medicines were also manufactured in Pennsylvania, New York, Ohio, Maryland, and Georgia.

The manufacture of bottles and jars for the packing and preserving industries, exclusive of the enormous production of fruit jars, has steadily advanced during the past decade, owing to the remarkable growth of the above interests and the increasing recognition of glass as the ideal package. In this branch of the bottle and jar industry the value of the product in 1900 was 9.8 per cent of the total value of all bottles and jars manufactured, and 45 establishments in 10 states reported. The products covered a wide range of glass food packages, the average value being $2.70 per gross. The manufacture of machine-made ware in this line is increasing, although constituting as yet a very small proportion of the total. The 3 leading states in the manufacture of bottles and jars for packers and preservers were New Jersey, Indiana, and Pennsylvania. In New Jersey, 35.6 per cent of the quantity and 29.3 per cent of the value of these products was manufactured; in Indiana, 31.6 per cent of the quantity and 32.4 per cent of the value; and in Pennsylvania, 14.5 per cent of the quantity and 19.8 per cent of the value. Illinois followed, with 10.3 per cent of the quantity and 9.2 per cent of the value. This class of ware was also manufactured in Ohio, New York, California, West Virginia, Maryland, and Georgia; these states reporting in the order given as to quantity and value of product.

The number of demijohns and carboys manufactured in 1900 was 83,243 dozens, valued at $206,061. The average value per dozen for the several states varied with the proportion of the state's output of the more expensive carboy or the cheaper demijohn, the average value of the carboy being about twice that of the demijohn. New Jersey was first in the value of demijohns and carboys manufactured in 1900, with 42 per cent of the total value, followed by Illinois with 23.8 per cent of the total value, Pennsylvania with 17.9 per cent, and New York with 9.2 per cent. Under the head of "all other products," bottles and jars which were not specified, valued at $940,277, were reported. A large variety of ware was embraced under this head. During the census year the manufacture of large glass jars and retorts for laboratory use and for water coolers was successfully accomplished in this country, the process having been brought from France.

There was no such close organization of manufacturing interests in the bottle and jar industry during the census year as in the plate glass, window glass, and tableware industries. Eastern and western manufacturers of bottles have relied upon a common understanding to regulate prices, with varying success, particularly in some lines such as flasks and prescription bottles. The manufacture of beer bottles was controlled by a few firms, and very satisfactory results in keeping prices uniform were the rule. The prices of fruit jars were regulated by a selling agency agreement among controlling manufacturing interests. The workmen in both the green and flint bottle and jar trades were well organized and their rules as to duration of factory operation and a uniform scale of wages, which affected a large majority of the factories in all branches of glass manufacture, were the strongest factors in maintaining uniformity of prices. The green bottle blowers' organization, the Glass Bottle Blowers' Association, organized about 1877, is one of the best managed and most progressive trades unions in the United States, and had a membership of about 4,000 and about $100,000 in cash in the treasury at the close of the census year. The organization of flint or prescription bottle blowers numbered about 1,500, and formed a branch of the American Flint Glass Workers' Union, one of the largest trades unions in the country. The scale of wages and the duration of the summer stop of the factories are fixed each year at a meeting of a joint committee representing organized workers and manufacturers. The only company stores in the glass trade in 1900 were in the bottle and jar branch of the industry. There were 10 of these stores, but in only two instances were the glass workers compelled to trade with them, as had been customary a short time before, the blowers' union having conducted a successful strike chiefly against the company store system. In 1890, 20 company stores were reported, 11 in connection with factories making bottles and jars and glassware, 8 in window glass works, and 1 in the plate glass branch. In 1880 there were 27 reported, as follows: 13 in connection with factories making bottles and jars and glassware, 12 in window glass works, and 2 in the plate glass branch.

Table 9 is a statement, by states, of the number of bottles manufactured, classified by capacity.

TABLE 9.—NUMBER OF BOTTLES MANUFACTURED, CLASSIFIED BY CAPACITY, BY STATES: 1900.

STATES.	BOTTLES.		
	4-ounce and under, number of gross.	4 to 16-ounce, inclusive, number of gross.	Over 16-ounce, number of gross.
United States	2,462,694	3,055,204	1,228,719
California	4,600	22,486	25,187
Georgia	13,000	17,000	7,350
Illinois	428,077	430,636	239,285
Indiana	562,345	872,318	199,947
Maryland	113,898	48,960	8,969
Massachusetts		4,865	1,561
Michigan	3,876	10,425	1,670
Missouri		46,667	23,333
New Jersey	764,385	614,385	130,046
New York	57,321	196,790	254,074
Ohio	74,015	195,054	94,338
Pennsylvania	405,528	496,670	199,310
Virginia	34,000	22,000	9,000
West Virginia	1,649	34,948	6,649
Wisconsin		42,000	28,000

It is possible that the statistics presented in the above table are not strictly accurate, as several establishments were unable to furnish more than an estimate of the number of bottles of each size manufactured. The total number of the three classes of bottles exceeds the total number reported in Tables 12 and 14 as "prescriptions, vials, and druggists' ware," "beers, sodas, and minerals," "liquors and flasks," and "patent and proprietary." This is probably accounted for by the fact that a large number of bottles included in the statement were not reported under either of the foregoing classifications, but were reported on the schedule under "all other products."

Pressed and Blown Glassware.—Pressed and blown lead and lime glassware manufactured in the United States is characterized by purity of color, excellence of design and finish, and cheapness of cost. The United States has been preeminent in the manufacture of pressed glassware ever since the invention of the process, which occurred about 1827 at a little plant in Sandwich, Mass., as the result of a suggestion of a carpenter who knew nothing of glass manufacture. His idea that molten glass could be pressed into any desired shape was at first regarded as absurd by experienced glass manufacturers.[1] Prior to this all glassware was blown, either offhand or in a mold, which required much greater skill and more time than the pressing operation.

About 37 years after the first glass press was constructed another important discovery was made, which so improved the composition of the batch for lime glass that, in purity and brilliancy, lime glassware was made to rival the more expensive lead glassware. Lime glass had been used in Europe and England for centuries in the manufacture of window glass, bottles and jars, and common tableware, and from an early period it had been used in the United States in the manufacture of tableware. But it was so inferior in purity and luster that it could not compete with lead glass, and was restricted to the cheapest and lowest grade of ware.

In 1864, according to the authority noted above, William Leighton sr., a glass manufacturer of Wheeling, W. Va., by the substitution of bicarbonate of soda for soda ash, and a better proportion of the materials in the batch, manufactured a lime glass that equaled in beauty the finest lead glass. This placed lime glass on a basis of competition with lead glass at less than one-half the cost. The almost immediate effect was a complete revolution in the manufacture, the production of lime glass rapidly increasing, while that of lead glass for tableware was soon reduced to a comparatively small quantity. The lime glass was not only cheaper, but had to be worked quicker than the lead glass, resulting, in connection with the use of the press, in a largely increased output.

The quantity of pressed ware manufactured has been greatly increased in the last decade by the removal of the arbitrary limit placed on the number of pieces to be made in a "turn" by the worker, and by the improvement of the old-style press by adding a rotating table carrying a series of molds, and operated by steam, compressed air, or electricity. The effectiveness of these improvements has been further increased by elaborating on the old wind system for cooling molds and workers. This increase in the speed of the old press without changing its basic form, and in that of the fire polishing and finishing operation, have been the notable changes during the last twenty years.

The effort to increase rapidity of production, especially in the last decade, was the principal characteristic of the pressed-ware trade. So well has this succeeded by the use of the improved press and continuous tank, that it has resulted in a large increase in the quantity manufactured, of common tumblers and jelly glasses, cheap, unfinished tableware, common lamps, etc., and a large reduction in cost, although the best grade of pressed ware is still made on the old hand press. For years American pressed tableware has been unrivaled in brilliancy and in its close imitation of the real cut glass, the fire-polish finish being the greatest factor in this success. In beauty and variety of design, pressed tableware has equaled if not surpassed the real cut ware, new designs being produced each year in great profusion and at large cost.

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[1] Tenth Census of the United States, "Report on Glass Manufacture," by Joseph D. Weeks, special agent, page 58.

During the last decade great mechanical progress has been made in the blown glass branch of the industry, but not to such an extent as in the production of fruit jars. Since 1897 a large number of thin blown tumblers have been made by machinery, and the same machine has been successfully applied to the manufacture of lamp chimneys, although trade conditions have restricted its advantages and prevented its operation in the manufacture of the latter to the extent reached on tumblers. In the manufacture of both tumblers and lamp chimneys, the machine greatly increases the output and lessens the expense of skilled labor. The machine has a circular table revolving around a central column or standard, the table carrying a series of duplicate molds, usually six. After the ball of glass has been gathered from the furnace on the blowpipe to the size required for the desired article, it is placed in the mold, which is closed, and the blowpipe held in place perpendicularly over the mold by a clamping device at the top of the machine, which engages with the upper end of the blowpipe. Over the mouthpiece of the pipe is placed a rubber hose which leads to a supply of air, furnished either by a compressing pump, or, if light pressure is required, as with some tumblers, by a fan system. The mechanical rotation of the table admits the air into the pipe, which is kept revolving, and blows up the glass in the mold until it is ready to be turned out for the finishing process. Ingenious mechanism regulates the air pressure. The entire operation is performed with great rapidity and it is claimed that the output of the machine is limited only by the ability of the workmen to supply the glass. The mechanical finishing of ware is now engaging the special attention of manufacturers, and a completely mechanical process, requiring small labor cost to perform the entire operation of finishing the ware after its removal from the blowpipe or mold, is the object sought. Manufacturers generally are of the opinion that more real progress will result from improvements in the finishing process than from further improvements in the mechanical process of making the ware. While the high-speed machine is a success on ordinary ware, both pressed and blown, the manufacture of high-grade ware seems to require the sympathetic touch of the skilled workman.

The manufacture of pressed and blown ware in 1900 was done almost entirely in Pennsylvania, Ohio, Indiana, West Virginia, and New York, only 3.7 per cent of the total value of such products being reported in Massachusetts, Illinois, Maryland, New Jersey, and Colorado. Specialization in manufacture was carried far in many lines, particularly in the manufacture of chimneys, tumblers, and lamps. Competition in nearly all lines was very active, particularly during the latter part of the decade, creating a strong tendency toward concentration of capacity along special lines, so as to manufacture at the lowest possible cost. The more rapid and safer handling of the ware, economy of working space in the factory, and facilities and conveniences for adding to the efficiency of the working force were considerations that received the greatest attention. Competition was so intense at the opening of the census year that all previous agreements between manufacturers as to prices were useless, and consequently prices of pressed and blown ware were unusually low. This was the principal cause of the formation of two close consolidations and additional general associations for the regulation of prices. The result was a decided improvement in prices during the latter half of the year. In July, 1899, a consolidation was effected of 7 establishments which manufactured lamp chimneys exclusively, and on November 1, 1899, 19 large pressed and blown ware establishments, equipped with about one-half of the available capacity of the United States, making a general line of tableware, tumblers, and novelties, came under the control of one central company. In 1891 a similar consolidation of 13 tableware establishments, principally in the immediate neighborhood of Pittsburg, Pa., was formed, and the number of plants was increased later. During the census year this company operated only 6 factories, 3 of which were in Pittsburg.

In the early part of the census year nearly all the manufacturers of pressed and blown ware agreed in forming an association to effectively maintain prices, and so successful was this association that on many articles unusually low prices, caused by sharp competition, were succeeded by quite profitable prices, which were well maintained. The association in attaining this end enlisted the aid of the jobbers by the establishment of a liberal rebate system, similar in some respects to the plan adopted by the consolidation of window glass manufacturers in the same year, although the latter went to the extent of forming the jobbers into an incorporated body pledged to cooperate with the manufacturing interests. The several consolidated companies engaged in the manufacture of glass established their headquarters in Pittsburg, which city, although it had lost nearly all the glass factories that had made it famous as the center of American glass manufacture, controlled more completely than ever, at the close of the census year, the manufacture of glass in the United States. Pittsburg was also the headquarters of all the glass-workers' associations, except that of the green bottle blowers, which was at Philadelphia. A large majority of the skilled workmen in the pressed and blown ware industry were members of the American Flint Glass Workers' Union, which was organized in 1878, and embraced the workmen in 14 different branches of the trade. The membership was about 7,000 and the treasury contained about $100,000. By means of this organization the manufacture was carried on under a practically uniform wage scale and with concerted action as to factory operation.

The manufacture of tableware, which consists of pressed and blown articles in sets ranging from two or three pieces to over a hundred, of very great variety of form and size, was confined to the 4 states of Pennsylvania, Ohio, Indiana, and West Virginia, in the order named. Twenty-seven establishments reported products valued at $2,617,784, or 15.3 per cent of the total value of all ware made in the pressed and blown division of the industry, and numbering 65,514,100 separate pieces. There was a very great variety in the value of the different kinds of ware, but the average value per 100 pieces for the United States was $4.

In Pennsylvania 55.7 per cent of the total quantity, and 60.6 per cent of the total value, was manufactured, and the average value per 100 pieces in that state was $4.35. A large proportion of the product for the state was manufactured in the Pittsburg district. In Ohio 23 per cent of the total quantity, and 25.5 per cent of the total value, was reported, and the average value was $4.43 per 100 pieces. The great bulk of the product was manufactured in the valley of the Ohio River. By the substitution of glass of a cheap quality made in tanks for glass made in pots, and worked with the press at higher speed than customary, and by dispensing with the fire-polishing operation, a class of cheap unfinished tableware and other glassware was manufactured in Indiana during the closing years of the last decade. This largely accounts for the fact that only 11.1 per cent of the total value of tableware manufactured in the United States, compared with 19.3 per cent of the quantity, was made in that state. The average value per 100 pieces was $2.31. The manufacture of tableware in West Virginia was conducted entirely along the banks of the Ohio River, and 2 per cent of the total quantity, and 2.8 per cent of the total value, was manufactured there, at an average value of $5.48 per 100 pieces. A considerable proportion of the product was blown ware.

Considerable rivalry exists among the manufacturers of pressed tableware in the production of attractive designs and decorations. Most of the ware is in imitation of cut ware, and so highly has the art been developed that a careful examination is frequently required to detect the difference. It is the custom with a majority of the establishments to offer new designs at the opening of each year, a large amount of money being expended to secure these designs and to prepare the required molds. The profitable life of a design, unless it is unusually popular, is limited to one season, its place being taken by some new idea expected to better catch the popular fancy. A popular design will, in one season, prove extremely profitable, while the losses on unpopular designs are so great as to make the expression of the public's favor an exceedingly interesting matter to the manufacturers. Popular favor has changed in the last decade from imitation cut ware to plain ware, and from that to highly decorated ware, but the imitation cut ware has been in most constant demand, although within the last few years colored ware and plain crystal with gold decorations have been strongly favored. Within the last half of the decade the manufacture of colored ware, to compete with the influx of imported Bohemian ware, has been assuming shape, and it seems probable that this profitable field will not much longer be left wholly undisputed to the foreign manufacturer.

Tableware has long formed a large proportion of the exports of glass from the United States, by reason of its superiority of color and design. The export branch of the business received special attention in 1900, traveling representatives having been sent through South America, Australia, and the United Kingdom, and a number of permanent agencies were established by the larger interests. For a long period large quantities of American tableware have been used in Canada, and a field of large proportions is being opened in Australia, one glass manufacturing establishment during the census year, having made a single direct shipment to that country of 10 cars, or about 1,500,000 pieces, a small part of which was common lamps. Thirteen establishments reported exports direct from factory of a total value exceeding $100,000, to Canada, Australia, Mexico, South America, Cuba, Hawaii, England, and Germany. This represented only a small part of the total exports of tableware during the census year, as the bulk of the trade was done through exporting houses. A growing tendency has been noted on the part of the manufacturers to export direct from the factories, and foreign needs are being closely studied with a view to the increase of the export trade in the future.

Jelly glasses and pressed tumblers and goblets, 102,528,600 pieces in number, valued at $2,007,386, were manufactured by 28 establishments in 5 states in 1900. The value of such ware was 11.8 per cent of the total value of all pressed and blown ware manufactured in the United States. The average value was 23 cents per dozen.

In Pennsylvania 36.4 per cent of the total quantity and 39.5 per cent of the total value was manufactured, and the average value for the state was 25.5 cents per dozen. The proportion manufactured in Indiana was 31.4 per cent of the total value and 35.7 per cent of the total quantity, at an average value of 21 cents per dozen. From Ohio was reported 9.6 per cent of the total value and 19.7 per cent of the total quantity, at an average value of 23 cents per dozen. The remaining 9.5 per cent of total value and 8.2 per cent of total quantity was manufactured about equally in Maryland and West Virginia, at an average value of 27 cents per dozen. At the close of the census year two large establishments, intended solely for the manufacture of jelly glasses and tumblers, were being built in West Virginia, and a large establishment was being erected in Ohio for the manufacture of the same class of ware by machinery and methods that were expected to still further reduce the cost and increase the possible output.

At the censuses of 1880 and 1890 incomplete returns were made of the manufacture of tumblers and goblets. In 1880, 46,415 dozen "tumblers" were reported from Massachusetts, 409,713 dozen from Ohio, and 2,500,000 dozen from Pennsylvania. In 1890, 5,438,700 dozen "tumblers and goblets," valued at $555,273, were reported as manufactured in Ohio; and 2,481,600 dozen, valued at $780,059, in Pennsylvania. The use of jelly glasses and tumblers in the packing trade is steadily increasing and there has been a steady growth in the exports.

Lamps manufactured in 1900 numbered 807,765 dozens, valued at $1,498,675, or $1.86 per dozen. They were in many varieties, from the most common pressed lamps to those ornately fashioned, and their value was 8.8 per cent of the total value of all pressed and blown ware. By far the largest proportion consisted of the commonest pressed grades. The manufacture was confined to 6 states and 27 establishments, several of which made a specialty of highly decorated lamps. The largest factory in the world making decorated lamps exclusively was located in Pennsylvania. Great progress was made during the last decade in the manufacture of decorated lamps of a medium grade, and this branch of the industry is receiving increased attention.

In Pennsylvania 65.6 per cent of the total value and 56.4 per cent of the total quantity was manufactured, at an average value of $2.16 per dozen. The largest proportion of Ohio's total product was common lamps; the quantity manufactured was 23.7 per cent of the total quantity, and the value 12.4 per cent of the total value, with an average value of 97 cents per dozen. In West Virginia, with the bulk of the production of decorated lamps, 18.4 per cent of the total value and 7.6 per cent of the total quantity was manufactured at an average value per dozen of $4.47. The lamps manufactured in Indiana were largely of a cheap grade; the quantity manufactured was 10.1 per cent of the total quantity, and the value 2.9 per cent of the total value, at an average value of 53 cents per dozen. Lamps were manufactured also in New York and Massachusetts, the product of the former state being largely common lamps, and that of the latter a better grade of ware.

The use of the tank in lamp manufacture has made possible a considerable reduction in cost from that of the old pot-melting method which was in general use in 1890. The manufacture of pressed lamps has been steadily increasing, resulting in a large reduction in the cost of the common article.

The value of lamp chimneys manufactured in 1900 was $2,719,583, the greatest in value of any single product reported under the pressed and blown glass branch of the industry, and was 15.9 per cent of the value of all pressed and blown glassware. The manufacture was reported in 6 states, but 90.4 per cent of the total value of products was manufactured in Indiana, Pennsylvania, and Ohio. The average value per dozen for the United States was 39 cents. Indiana led, with a product constituting 45.1 per cent of the total quantity and 44 per cent of the total value, the average value being 38 cents per dozen. Pennsylvania was second with 26.6 per cent of the total quantity and 23.5 per cent of the total value, at an average value of 35 cents per dozen. The quantity of lamp chimneys manufactured in Ohio was 21.9 per cent of the total, and the value 22.9 per cent; the average value per dozen was 42 cents. The remaining states in which lamp chimneys were manufactured were Illinois, New York, and Massachusetts. There were 27 establishments engaged in the manufacture.

A comparison of the statistics for 1900 with the incomplete statistics for 1890 and 1880 shows how the manufacture of chimneys has moved westward, following the natural gas and cheap fuel, and also gives some idea of the extent the production has been curtailed by the increased use of gas and electric light. The total number reported in 1890 was 7,534,473 dozens, valued at $1,816,016, and distributed as follows: Ohio, 4,025,120 dozens, valued at $541,836; Pennsylvania, 2,885,841 dozens, valued at $1,017,639; New York, 623,512 dozens, valued at $256,541. In 1880 the total number reported for the United States, no value being given, was 4,463,140 dozens, distributed as follows: Pennsylvania, 2,719,649 dozens; New York, 888,639 dozens; Ohio, 743,140 dozens; and Massachusetts, 111,712 dozens. No lamp chimneys were reported as manufactured in Indiana in either 1880 or 1890; this state was first, however, in 1900 in this branch of the industry, and succeeded Ohio, which was the leading state in 1890. This change in the relative positions of these two states was coincident with a similar change in the supply of natural gas. A decrease of 8.4 per cent in the total quantity manufactured in the United States is shown from 1890 to 1900, while the total value in 1900 exceeds that of 1890 by 49.8 per cent; this was due largely to the extremely low value reported for the product of Ohio in 1890, which was more than one-half of the total quantity reported at that time.

During the last decade the improvement in the manufacture of lamp chimneys was shown by better quality and a greater variety of design. There has been a large increase in the use of higher grade chimneys of special design. Special attention has been given to the package for fine grade ware, and a large number of such chimneys have, within the last few years, been packed in separate cartons, resulting in a decided improvement in appearance and in safety of shipment.

The manufacture of lamp chimneys by the blowing machine was limited to two factories in 1900, and in only one of these plants was it carried on extensively, being confined largely to a cheap class of goods. Machine-blown lamp chimneys will probably represent a large proportion of the production in the near future, although it is questioned if the higher grades of chimneys will not require hand work. During 1900 the lamp chimney market was fairly well regulated by an agreement between the largest manufacturing interests, but a number of small establishments in Indiana were causing demoralization in lime glass chimneys, or the cheap grade of goods. During the census year the tank furnace became a factor in the manufacture of the common lime glass chimneys, 4 tanks being reported. Great strides had also been taken toward improved factory equipment for handling the ware; lehrs operated by electricity, electric conveyors to take the ware from the lehr to the packer and then to the stock room or car, were among the improvements made, together with a great increase in the rapidity of the finishing operation. A good export trade has been developed in this branch of the industry. Large shipments have been made for many years by export houses, but during the census year the manufacturers renewed attempts to reach the export trade direct, and a special effort to introduce the American lamp chimney into England was successful, 66,667 dozen chimneys being reported as sent direct from factory to England during the year. The remainder of the exports that were shipped direct from the factories were sent to South America and Mexico.

Lantern globes were manufactured during the census year in 6 states by 27 establishments, and the number reported was 1,044,816 dozens, valued at $497,021, or 2.9 per cent of the total value of all pressed and blown ware manufactured. The average value per dozen was 48 cents, the average value by states ranging from 25 cents to $1.17 per dozen, depending upon the quality of the ware. There were two establishments employed exclusively in the manufacture of lantern globes, one in Indiana and one in West Virginia. The percentages of the product manufactured in the leading states, of the total for the United States, are as follows: Indiana, 52.4 per cent of the quantity and 35.4 per cent of the value, with an average value per dozen of 32 cents; New York, 15.5 per cent of the quantity and 38.2 per cent of the value, with an average value per dozen of $1.17; Ohio, 13.7 per cent of the quantity and 14 per cent of the value, with an average value per dozen of 49 cents; West Virginia, 12.6 per cent of the quantity and 6.6 per cent of the value, with an average value per dozen of 25 cents; Pennsylvania, 5.6 per cent of the quantity and 5.4 per cent of the value, with an average value per dozen of 46 cents. A small proportion was manufactured also in Massachusetts. Indiana and West Virginia supplied the great bulk of the output of cheap lantern globes, while New York led in the manufacture of ware of a higher grade. There were no statistics of the manufacture published at the census of 1890, but a great increase has been made during the decade. During the census year very active competition on the cheaper grades of lantern globes was developed. More than 10,000 dozen lantern globes were reported in 1900 as exported direct from the factories to Mexico and Central America: this represented but a small part of the total exportation.

The manufacture of pressed and blown shades, globes, electric bulbs, and glassware for gas and electric lighting ranked third in value of products in the pressed and blown ware branch of the industry in 1900, being 14.6 per cent of the total. The shades and globes ranged in quality from the plain pressed Welsbach gas article to the most costly and artistic products in fine plain and colored glass, richly decorated, engraved, or etched. The manufacture of glassware for the Welsbach gas light had developed to a very large extent. Electric glassware, such as incandescent bulbs and arc globes, formed a large item, although foreign competition in that line was quite active. The manufacture of gas and electric glassware has been largely a development of the last decade, and it is now one of the specialized lines of the industry. Although the increased use of gas and electricity has curtailed the use of the oil lamp in some quarters, yet a tendency has been shown toward the use of fancy lamps with highly decorated or ornamented shades and globes, more for decorative effect, probably, than real use, and this has greatly stimulated the production of globes and shades of a much higher quality in general than was ever before manufactured. The total production of shades, globes, and gas and electric goods in 1900 was manufactured in 7 states, from 3 of which, Pennsylvania, New York, and Ohio, 94.9 per cent of the total value was reported. There were 30 establishments engaged in the manufacture of these goods on a more or less extensive scale. The average value per dozen for the United States was 93 cents, the average value by states varying as the bulk of the output was cheap gas and electric ware or decorated shades and globes.

From Pennsylvania was reported 32 per cent of the total quantity and 58.1 per cent of the total value, the average value per dozen being $1.70. Large quantities of medium-priced globes and shades, cheap gas goods, and a valuable production of globes and shades of the finest quality were manufactured in that state. In New York a large quantity of high-grade shades and globes, and a large output of electric bulbs were manufactured. The quantity of articles of this class manufactured was 11.7 per cent of the total, and the value 20.8 per cent, with an average value per dozen of $1.66. A large number of electric bulbs was manufactured in Ohio, which was third in rank as to value of products, but was far in the lead as to quantity, with 52.3 per cent of the total quantity reported and 16 per cent of the total value, the average value per dozen for the state being 28 cents. Shades, globes, and gas and electric goods were manufactured also in West Virginia, Massachusetts, Indiana, and New Jersey. Decorated shades and globes constituted the larger part of the product in West Virginia, and the product in Indiana was electric and gas ware, at an average value of 13 cents a dozen. Shades and globes were manufactured in Massachusetts, and in New Jersey the product was entirely electric bulbs. Great improvements have been made in the last few years in the package for shades and globes, nearly all the better grade being packed in separate cartons. The export trade has had a steady growth, but complete statistics were not obtained from the factories. A total of 44,200 dozen articles in this branch of the industry, mostly electric ware, was reported in 1900 as shipped direct from the factories to Canada, the West Indies, South America, and Australia. By far the largest proportion was exported to Canada.

Blown tumblers, stemware, and bar glasses, 6,127,367 dozen in number, were reported in 1900 by 17 establishments in 4 states. These products constituted 9.4 per cent of the value of all pressed and blown ware manufactured. The average value per dozen for the United States was 26 cents. The manufacture of this class of ware has become greatly concentrated, 94.3 per cent of the total value of products being reported from Pennsylvania and West Virginia. The percentages of the total quantity and total value manufactured in the two leading states are as follows: Pennsylvania, 57.3 per cent of the quantity and 69.3 per cent of the value, with an average value of 31 cents per dozen; West Virginia, 37.4 per cent of the quantity and 25 per cent of the value, with an average value of 17 cents per dozen. The remainder of the product was manufactured in Ohio and Indiana, the average value per dozen in Ohio being 25 cents, and in Indiana, 34 cents. The returns do not embrace the total production of blown tumblers, as many were reported under "cut glass," having received light cutting. A large proportion of the lower grade of blown tumblers manufactured in Pennsylvania was made on the blowing machine, but practically all the finer grades were made by hand. Great improvements in the finishing of this class of ware have been made in the last few years, and much of the "cracking-off" is done by a machine on which a gas jet is used in place of a wire, one machine, operated by a boy, having a capacity of 9,000 tumblers a day. Improvements in grinding machinery have made it possible for two girls with one machine to grind 22,500 dozen tumblers in a week. For a long period blown tumblers, stemware, and bar goods have formed a large item in glass exports, being shipped to the principal countries of the world in steadily increasing quantities.

Decorated opal or porcelain glassware was very much in favor with the public during the closing years of the last decade. It was made into small-piece sets, in an endless variety of novelties and toilet articles. In 1900 the manufacture of 3,750,443 dozen pieces was reported, representing 9.3 per cent of the total value of pressed and blown glassware manufactured. In large part the decorations were of the cheapest kind, the average price per dozen for the United States being 42 cents. Twenty-six establishments in 6 states reported its manufacture, and 90.7 per cent of the total value of the products was made in Pennsylvania and West Virginia. Establishments in Pennsylvania made 78 per cent of the total quantity and 76.8 per cent of the total value, and in West Virginia 12.8 per cent of the total quantity and 13.9 per cent of the total value. Establishments in Indiana, Ohio, Massachusetts, and New York were engaged also in manufacturing this class of ware. The great demand for decorated opal or porcelain glassware developed within the last half of the decade, and in 1900 its manufacture formed a prominent part in the operations of some of the largest pressed ware establishments in the country, leading to a large increase in the decorating facilities of those plants. The craze for opal ware was decreasing at the close of the census year and the production gave evidence of soon returning to normal proportions.

Cut glassware, 134,726 dozen pieces in number, valued at $672,463, an average of $4.99 a dozen, was reported by 12 establishments in 1900. This report does not cover the numerous glass-cutting establishments in which the basic material used is the glass blank and in which the manufacture consists merely in reworking the glass. A large portion of the cut glass reported from Pennsylvania and West Virginia was light-cut articles, such as tumblers, although there was 1 establishment in Pennsylvania engaged largely in the manufacture of cut ware of the highest grade. The percentages of the total quantity and total value manufactured in the several states are as follows: Pennsylvania, 42.2 per cent of the total quantity and 46.3 per cent of the total value, at an average value of $5.48 per dozen pieces; Massachusetts, only 2.5 per cent of the total quantity but 21.8 per cent of the total value, the average value of $44 per dozen indicating the manufacture of the richest cut ware; the same is true of Ohio, with only 2.2 per cent of the total quantity and 18.7 per cent of the total value, an average value per dozen of $43.45. In West Virginia, with its large production of blown ware, practically all light cutting was done, the product averaging $1.23 per dozen in value; the product of that state was 23 per cent of the total quantity, but only 13.1 per cent of the total value.

West Virginia was first in the number of pieces manufactured, although its product was practically all of the cheapest kind. A small product was also reported from Indiana. The largest part of the cut glass manufactured was made in establishments in which the glass was reworked only, and is not included in this report. A list of such establishments, published at the close of the census year, giving the number in each state, was as follows: New York, 21; Pennsylvania, 13; Illinois, 4; Connecticut, 2; and Massachusetts, Rhode Island, New Jersey, West Virginia, and Michigan, 1 each. The industry has had a large growth in the last decade, particularly during the latter part of it, the number of establishments having doubled and the number of frames operated more than trebled. The demand has steadily increased and the market widened as prices have been lowered by competition. The popularity of pressed ware in imitation of cut ware shows the widespread desire for the real cut article. An improvement that will probably be made in the industry is the manufacture of the blank by pressing, increasing the speed of manufacture fourfold over the blowing process. It was for a long time the practice to import the blanks from France for most of the finest grade of ware cut in this country, but the domestic blank is now conceded by competent judges to be equal, if not superior, and is steadily supplanting the imported article. The superiority of American rich cut glass is generally acknowledged at home and abroad.

The amount reported as the value of all other pressed and blown ware products, $1,384,945, includes a large variety of articles for different purposes. One item that has come into prominence during the last few years is the manufacture of prismatic glass for increasing the diffusion of sunlight in buildings. The product of the only establishment manufacturing glass play marbles in the United States, located in Ohio, is included in this total.

The value of all products other than glass reported by establishments manufacturing pressed and blown ware and bottles and jars was $690,562, a large item being packages, particularly for lamp chimneys. According to some manufacturers, the profit in certain lines of chimneys lies entirely in the sale of the package.

MATERIALS.

Table 10 is a comparative summary of the quantity and cost of the materials used, with percentages of increase, for 1890 and 1900.

TABLE 10.—QUANTITY AND COST OF MATERIALS USED, 1890 AND 1900, WITH PER CENT OF INCREASE.

	1900	1890	Increase.	Per cent of increase.
Total cost	$16,731,009	$12,140,985	$4,590,024	37.8
Glass sand, tons	581,720	369,328	212,392	57.5
Cost	$846,822	$899,998	[1]$53,176	[1]5.9
Soda ash, tons	157,779	96,777	61,002	63.0
Cost	$2,259,939	$3,108,233	[1]$848,294	[1]27.3
Salt cake, tons	53,257	38,092	15,165	39.8
Cost	$518,590	$604,179	[1]$85,589	[1]14.2
Nitrate of soda, tons	10,770	7,031	3,739	53.2
Cost	$320,937	$278,291	$42,646	15.3
Limestone, tons	91,015	45,482	45,533	100.1
Cost	$181,717	$136,450	$45,267	33.2
Lime, hundredweights	794,679	743,765	50,914	6.8
Cost	$147,901	$150,092	[1]$2,191	[1]1.5
Arsenic, pounds	2,349,261	1,823,007	526,254	28.9
Cost	$112,630	$61,575	$51,055	82.9
Manganese, pounds	1,493,538	610,915	882,623	144.5
Cost	$57,493	$31,080	$26,413	85.0
Litharge, pounds	8,386,106	5,501,559	2,884,547	52.4
Cost	$490,200	$300,096	$190,104	63.3
Potash or pearlash, pounds	4,406,211	2,544,978	1,861,233	73.1
Cost	$186,847	$135,047	$51,800	38.4
Grinding sand, tons	265,438	227,416	38,022	16.7
Cost	$166,040	$151,995	$14,045	9.2
Fire clay or pot clay, pounds	32,151,017	37,066,652	[1]4,915,635	[1]13.3
Cost	$221,183	$328,903	[1]$107,720	[1]32.8
Pots, not including those made at works, number	8,941	8,006	935	11.7
Cost	$381,147	$393,875	[1]$12,728	[1]3.2
Fuel, cost	$3,203,146	$2,340,912	$862,234	36.8
Packages and packing materials, cost	$4,913,544	$1,853,462	$3,060,082	165.1
All other materials, cost	$2,722,873	$1,366,797	$1,356,076	99.2

[1] Decrease.

The cost of materials used in the combined industry of glass manufacture in 1900 was 37.8 per cent greater than in 1890. In nearly all the principal materials, a comparison of returns for 1900 with those for 1890 shows a large increase in the quantity used and a decided decrease in the average cost per unit, notwithstanding the fact that in 1900 the prices of practically all glass-making materials were sharply advanced. An increase of 57.5 per cent is shown in the total number of tons of glass-melting sand reported used in 1900 over 1890, 581,720 tons being reported in 1900 and 369,328 in 1890. On the other hand, a decrease of 5.9 per cent in total cost is shown in 1900 from 1890, the total cost in 1890 being $899,998, while in 1900 the total cost was $846,822. The average cost per ton in 1900 was $1.46 compared with $2.44 in 1890. Glass sand of very fine quality in practically inexhaustible supplies, is found in many parts of the country, although the chief sources of supply are still, as they have been for many years, the Juniata Valley in Pennsylvania; Hancock county, West Virginia; the Fox River district in Illinois; and St. Charles, St. Louis, and Jefferson counties in Missouri. By far the largest proportion of the glass sand used comes from these deposits, although southern New Jersey still furnishes sand for a number of factories in the East, and sand of the finest quality still comes from Berkshire, Mass. The cost of transportation and the fine quality of more available deposits have considerably restricted the output from the latter locality. During the census year a considerable quantity of good glass sand came from Westmoreland county, Pennsylvania.

The preparation of sand for the glass factories became a highly specialized business during the last decade, about a score of establishments being exclusively engaged in the industry, with elaborately equipped plants representing large investments. The active competition which developed among these establishments is principally accountable for the large decrease in price in 1900 compared with 1890. Eight establishments in the Juniata Valley were merged under one head during the census year and prices on all grades of sand were sharply raised. Many glass manufacturers, however, had contracted for their supply for the season during the period of low prices, and, in addition, two of the largest manufacturing interests were mining and preparing their own sand to a large extent, making it cost them considerably below the average. Competition has led to the greatest care and attention in the preparation of the glass sand and the maintenance of a high quality.

The supply of soda ash for glass manufacture formerly came almost entirely from England; but during the last decade, through the development of the Solvay process, practically all soda ash used in glass making was of domestic manufacture, coming mainly from Syracuse, N. Y., and near Detroit, Mich. A large plant was projected during the census year at Barberton, Ohio, by glass manufacturing interests. One of the greatest advances in the domestic manufacture of soda ash was the establishment during the decade of large works at Wyandotte, Mich., by glass manufacturers to directly supply their wants. The number of tons of soda ash reported in 1900 was 157,779, compared with 96,777 tons in 1890, an increase of 63 per cent, while the total cost in 1900 was $2,259,939, compared with $3,108,233 in 1890, a decrease of 27.3 per cent. The average cost per ton in 1900 was $14.32, compared with $32.12 in 1890. The demand for soda ash in 1900 was unusually large, exhausting the domestic supply and greatly increasing importations. This abnormal demand came from outside the glass industry, the textile industry using a large quantity, and is shown by the large increase of importations in 1900 over 1899. As reported by the Bureau of Statistics of the Treasury Department, imports entered for consumption were 80,118,967 pounds, valued at $665,104, in 1900, compared with 41,844,101 pounds, valued at $304,549, in 1899.

The salt cake used in glass making twenty years ago was nearly all imported, but the greater portion of the amount consumed in the census year was of domestic manufacture, many large chemical manufacturers furnishing it, to the almost total exclusion of the foreign product. Competition has lowered the average cost per ton 38.6 per cent from 1890 to 1900, the average cost per ton for the respective years being $15.86 and $9.74. The number of tons used in 1890 was 38,092, costing $604,179, compared with 53,257 tons in 1900, costing $518,590, an increase in quantity of 39.8 per cent and a decrease in cost of 14.2 per cent.

Practically the entire supply of nitrate of soda used in glass manufacture in the United States comes from South America. The number of tons used in 1890 was 7,031, costing $278,291, compared with 10,770 tons in 1900, costing $320,937, an increase in quantity of 53.2 per cent and in cost of 15.3 per cent. In 1890 the average price per ton was $39.58, compared with $29.80 in 1900.

The number of tons of limestone used in glass manufacture in 1900 was 91,015, costing $181,717, or an average of $2 per ton, compared with 45,482 tons in 1890, costing $136,450, or an average cost of $3 per ton. The increase in the quantity used in 1900 over 1890 was 100.1 per cent, and in cost 33.2 per cent. Ohio and Indiana were the principal sources of supply.

The quantity of lime used in 1900 was 794,679 hundredweight, costing $147,901, compared with 743,765 hundredweight in 1890, costing $150,092, an increase in 1900 over 1890 of 6.8 per cent in quantity and 1.5 per cent in cost. The average cost per hundredweight in 1890 was 20.2 cents, and in 1900 was 18.5 cents. Much of the lime is wood-burned and ground and bolted, the industry being highly developed in Seneca county, Ohio, and vicinity.

England has been the chief source of the supply of arsenic used in glass manufacture. Recently, however, the imports from that country have been greatly reduced by the supply from the gold fields of British Columbia. At the close of the census year, movements were in progress which promised to result in the development of the manufacture in this country, and it is confidently asserted that in a few years the glass industry will be supplied entirely by arsenic of domestic manufacture. In 1890, 1,823,007 pounds were reported, costing $61,575, and in 1900, 2,349,261 pounds, costing $112,630, an increase of 28.9 per cent in the quantity and 82.9 per cent in the cost.

Manganese, which comes largely from Saxony, was used in 1890 in glass making to the extent of 610,915 pounds, costing $31,080, compared with 1,493,538 pounds in 1900, costing $57,493, an increase in quantity of 144.5 per cent and in cost of 85 per cent. The average price per pound was 5.1 cents in 1890 and 3.2 cents in 1900.

The proportion of litharge manufactured in the United States for use in glass manufacture is steadily increasing, but a large proportion is still imported from England. The quantity used in 1890 was 5,501,559 pounds, costing $300,096, compared with 8,386,106 in 1900, costing $490,200, an increase in quantity of 52.4 per cent and in cost of 63.3 per cent. The average cost per pound in 1890 was 5.5 cents and in 1900 was 5.8 cents.

There were 2,544,978 pounds of potash or pearlash, which was supplied principally from Germany, used in 1890, costing $135,047, compared with 4,406,211 pounds in 1900, costing $186,847, an increase in quantity of 73.1 per cent and in cost of 38.4 per cent. The average cost per pound in 1890 was 5.3 cents and in 1900 was 4.2 cents.

A notable increase is shown in the consumption of packages and packing materials in 1900 over 1890. The cost of such materials in 1890 was $1,853,462 compared with $4.913.544 in 1900. an increase of 165.1 per cent. The neatness of the package received special attention during the latter part of the decade, and great improvement has resulted, compared with the practice followed formerly.

IMPORTS AND EXPORTS OF GLASS.

Table 11 presents the value of the different kinds of glass imported and exported from 1869 to 1900. inclusive.

TABLE 11.—VALUE OF GLASS IMPORTED AND EXPORTED: 1869 TO 1900.[1]

YEAR.	IMPORTS.										EXPORTS.		
	Total value.	Bottles, vials, carboys, etc.[2]	Cylinder and common window glass, unpolished.	Cylinder and crown glass, polished.		Plate glass.			Glass plates or disks for optical instruments.[4]	All other.	Total value.	Window glass.[5]	All other.
				Unsilvered.	Silvered.[3]	Fluted, rolled, or rough.	Cast, polished, unsilvered.	Cast, polished, silvered.					
1900	$5,037,931	$464,483	$1,555,924	$539,082	$286	$7,915	$226,295	$12,413	$125,449	$2,106,084	$1,936,119	$36,218	$1,899,901
1899	4,303,660	371,394	1,275,184	521,957	622	9,528	233,190	419	119,832	1,771,534	1,503,651	32,690	1,470,961
1898	3,782,617	338,861	953,116	569,380	66,768	9,880	161,637	562	107,572	1,574,841	1,211,084	23,480	1,187,604
1897	5,603,868	600,308	1,181,696	301,412	772,296	18,245	285,485	21,870	94,242	2,328,314	1,208,187	13,369	1,194.818
1896	7,528,420	382,101	1,067,999	190,704	1,158,321	23,486	773,250	34,119	92,628	3,805,812	1,062.225	14,994	1,047,231
1895	6,627,473	531,904	835,730	61,212	782,778	23,990	684,131	16,740	85,794	3,605,194	946,381	11,140	935,241
1894	5,288,697	506,183	1,067,787	22,314	786,004	38,121	449,086	75,106	71,881	2,272,215	922,072	19,311	902,761
1893	8,082,639	739,037	1,496,326	91,559	1,679,185	70,493	829,596	154,404	60,898	2,961,141	973,827	10,229	963,598
1892	8,828,952	827,761	1,674,679	158,464	1,549,968	56,162	887,626	119,201	69,988	3,485,103	942,302	10,238	932,064
1891	8,463,935	926,010	1,475,338	91,248	1,912,391	78,030	1,351,808	183,015	99,623	2,346,472	868,374	11,244	857,130
1890	7,411,343	912,704	1,461,736	74,546	1,529,401	84,715	931,323	249,819	58,830	2,108,269	882,677	8,910	873,767
1889	7,724,662	825,411	1,444,982	91,105	756,577	130,172	983,316	1,243,455	10,741	2,238,903	894,200	16,864	877,336
1888	7,867,263	815,564	1,397,898	95,147	59,208	131,224	1,258,736	1,801,514	12,538	2,295,434	881,628	10,733	870,895
1887	7,336,771	739,240	1,420,159	85,500	1,262	90,899	1,191,134	1,647,154	16,876	2,144,547	883,504	15,955	867,549
1886	6,358,085	609,435	1,360,955	27,807	....	107,057	907,267	1,528,379	19,988	1,797,197	773,878	8.246	765,632
1885	6,256,194	590,160	1,630,844	18,287	189	118,693	900,461	1,192,147	....	1,805,413	783,915	10.055	773,860
1884	7,552,498	521,787	2,431,068	28,695	....	101,777	959,817	1,387,728	....	2,121,626	839,756	18,665	821,091
1883	7,762,543	....	1,736,700	62,630	....	62,898	1,145,709	1,226,432	....	3,528,174	998,857	....	998,857
1882	6,634,371	....	1,387,257	27,117	....	56,407	1,183,482	943,706	....	3,036,402	864,235	....	864,235
1881	5,878,025	....	1,414,709	57,754	....	32,422	979,452	833,385	....	2,560,303	756,022	....	756,022
1880	5,221,511	....	1,439,447	15,601	....	22,799	835,496	911,144	....	1,997,024	749,866	....	749,866
1879	3,222,479	....	595,070	11,110	....	6,527	699,459	575,549	....	1.334,764	768,644	....	768,644
1878	3,345,149	....	812,612	7,168	....	5,685	885,823	572,066	....	1,061,795	869,682	....	869,682
1877	3.936,786	....	1,006,456	8,482	....	14,405	1,263.864	552,899	....	1,090,680	658.061	....	658,061
1876	4,806,948	....	1,292,020	5,448	....	29,069	1,358,881	773,423	....	1,348,107	628.121	....	628,121
1875	5,805,115	....	1,656,040	21,166	....	47,265	1,620,032	887,847	....	1,572,765	691,310	....	691,310
1874	6,257,964	....	1,881,368	14,933	....	34,237	1,655,909	961,512	....	1,710,005	631,827	....	631,827
1873	7,420,044	....	2,759,728	21,217	....	34,180	1,550,857	823,076	....	2,230,986	627,562	....	627.562
1872	5,834,712	....	2,103,827	23,931	....	17,697	1,063,810	803,487	....	1,821,960	547,112	....	547,112
1871	4,269,620	....	1,447,292	16,738	....	26,191	919,435	651,487	....	1,208,477	466,447	....	466,447
1870	4,157,634	....	1,459,067	18,501	....	24,684	820,252	615,347	....	1,219,783	530,654	....	530,654
1869	3,895,739	....	1,466,138	25,885	....	22,173	717,952	625,338	....	1,038,253	580,718	....	580,718

[1] Reports of United States Treasury, Bureau of Statistics.
[2] Included in "all other" glass and glassware imported previous to 1884.
[3] Included in "unsilvered cylinder and crown glass, polished" previous to 1885.
[4] Not separately reported previous to 1886.
[5] Included in "all other" glass and glassware exported previous to 1884.

The import figures presented in Table 11 for "cylinder and crown glass, polished," and plate glass, silvered and unsilvered, show the great victory the American manufacturers of polished plate glass have gained in superseding the foreign article, particularly the foreign mirror plate, by glass of domestic manufacture. The silvered, polished crown glass is styled German looking-glass plate, while the silvered polished plate glass is what is commonly known as French mirror plate. The German plate is lighter and inferior to the French plate and is nearly all imported under 5 square feet in dimensions, while the French plate is of larger sizes. From 1869 to 1889, inclusive, the value of importations of French mirror plate was nearly equal to the imports of polished plate glass unsilvered, the aggregate value of the French mirror plate during the twenty-one years being $20,557,075 while the value of the unsilvered polished plate was $22,901.144. Previous to 1885 the importations of the German mirror plate are included in the table with the unsilvered polished cylinder and crown glass, the larger part of the polished cylinder and crown imported to that date being employed for car windows and similar uses where a glass thinner than ordinary plate and of better quality than common window glass was desired. The importations of silvered German mirror plate previous to 1889 were inconsiderable, but in that year their value increased from $59.208 in 1888 to $756.577. or 1.177.8 per cent.

The year 1889 marked the beginning of the decline of the importations of French mirror plate and the growth of the importations of German plate. The value of imported French silvered plate in 1890 was only $249,819, a decrease of 79.9 per cent from the previous year; this was due in part to the introduction of American plate, but more to the remarkable increase in importations of the cheaper German plate.

The value of the German silvered plate imported in the same year increased $772,824, or 102.2 per cent over 1889. For the next seven years, German silvered plate importations exceeded in value the combined value of silvered and unsilvered polished or French plate. The plate glass manufacturers of the United States during this time were directing their competition against the more profitable field filled by the French silvered and unsilvered plate, so that the German plate had nearly a clear field. However, an increase of plate glass productive capacity in the United States in 1894 produced a period of low prices that caused large reductions in the value and number of square feet of all foreign plate imports, reducing the value of imported French mirror plate 51.4 per cent from 1893 to 1894; German silvered plate 53.2 per cent; polished plate and rough plate, each 45.4 per cent; and unsilvered polished cylinder and crown glass 75.6 per cent. From this period of low prices a better organization of the American plate glass manufacture developed, a consolidation of individual companies controlling a large percentage of the capacity being formed; and the fight against foreign glass was carried on so successfully that from 1894 French mirror imports have dwindled to insignificant proportions, being, in 1900, 83.5 per cent less than in 1894 and 95 per cent less than in 1890. During 1895 and 1896 imports of polished plate, unsilvered, increased to some extent, caused largely by the sale in the United States at low prices of surplus foreign stock. After 1896, however, the American manufacturing interests lined up more closely against the foreign trade, and since then the value of imported polished plate has been gratifyingly small, showing in 1900 a decrease of 70.4 per cent from 1896 and 79.8 per cent under the total value of 1890.

While German mirror import values received a decided check in 1894 and 1895, the next two years witnessed a revival and a change in the form of importation, an increased quantity being imported unsilvered, to be silvered by American mirror makers. Table 11 shows a marked decrease in the value of silvered German plate imports in 1897 and a considerable increase in the unsilvered imports. American competition has made it advantageous to have the silvering done in this country. With French mirror plate practically excluded, the plate-glass manufacturers of the United States took up the German mirror plate problem, and by selling superior polished plate to the mirror trade at cost, or less, reduced the value of German plate imports, unsilvered and silvered, nearly one-half in 1897, and at present have stopped the importation of the German silvered plate even more completely than they have the French product. In 1900 practically all the German plate was imported unsilvered, and was much less than the total quantity, silvered and unsilvered, annually imported from 1890 to 1897.

A portion of the imported polished cylinder and crown glass comes in competition with domestic window glass for car windows, but the expected development of the manufacture of thin polished plate glass in this country may probably supplant the foreign article for high-quality and light-weight glazing purposes. Ninety-five and five-tenths per cent of the total quantity of unsilvered polished cylinder and crown glass imported in 1900 was shipped from Germany, the remainder being divided among Austria-Hungary, Belgium, France, Netherlands, and the United Kingdom. Of the total quantity of fluted, rolled, and rough plate imported in 1900, the United Kingdom supplied 91.3 per cent and France, Belgium, and Germany, the remainder. The importation of polished plate glass is controlled by an European syndicate, and is apportioned among the various producing countries; Belgium furnishing, in 1900, 80.2 per cent of the total quantity; Germany, 8.1 per cent; and the United Kingdom and France, practically all the remainder. The extent of the importation is determined largely by trade conditions abroad, this market being used for the disposal of surplus products, with slight regard to price. New York is the principal port of entry for plate glass.

The value of importations of fluted, rolled, and rough plate has steadily decreased, being, in 1900, 90.7 per cent less than in 1890. The total value of such imports in 1900 was nearly equaled by the direct export shipments of one American skylight factory.

Window glass importation values have maintained comparative regularity during the last thirty years. The total value of window glass imported during the decade ending with 1880 was $14,993,860; from 1880 to 1890, $15,686,308; and from 1890 to 1900 the value was $12,583,779. While the total value of window glass imported during the last decade was less than that of each of the two preceding decades, the value in 1900 exceeded that in 1890 by 6.4 per cent; 1880 by 8.1 per cent; and 1870, by 6.6 per cent. The number of pounds imported in 1900, as reported by the United States Treasury Bureau of Statistics, was 51,343,339, which, estimating 70 pounds to the 50-foot box, 25 per cent double strength, equals 733,476 boxes, or 16.9 per cent of the quantity manufactured in the United States in that year. The number of pounds imported during each of the preceding ten years was as follows: 1899, 47,202,267; 1898, 38,908,992; 1897, 55,961,813; 1896, 53,182,301; 1895, 40,786,279; 1894, 52,437,068; 1893, 63,715,989; 1892, 72,682,127; 1891, 58,932,738; 1890, 73,112,550. The imports, 92.7 per cent of which come from Belgium and the remainder from the United Kingdom, Germany, and France, are regulated largely, as in plate glass, by the condition of the foreign market. The Continental and far Eastern markets are the most profitable fields for Belgian window glass, and if the demand in these markets is weak and a surplus stock accumulates in Belgium, increased shipments to the United States follow. Belgian glass, the product of cheaper labor, constantly acts as a check on window-glass prices in the United States, for unless the demand abroad is unusually strong, the first announcement of high prices in this country results in an increase of exports. The foreign window glass, as in the case of plate glass, was for a long time credited with superior quality, especially as to finish, but in both cases that claim has been disproven in the progress of the American plate and window glass manufacture during the last decade. In 1900 Boston, Mass., was the principal entry port for foreign window glass, followed by New York, N. Y. The entry ports for the South are St. Louis, Mo.; Baltimore, Md.; Newport News, Va.; and New Orleans, La. Previous to 1901 most of the window glass used on the Pacific coast was of foreign manufacture, entering principally at San Francisco. The cheapness of ballast freight rates of wheat-carrying ships returning to the Pacific coast, compared with the expensive overland freight rates from the domestic window-glass factories, gave the foreign glass a great advantage, but American manufacturers, by a decided differential in price and systematic distributing arrangements, have succeeded lately in steadily reducing the importations to that section of the country.

The value of imports of bottles, vials, carboys, etc., has shown an almost constant decrease from year to year during the last ten years. The total value in 1900 was $464,483, or 49.1 per cent less than in 1890. About one-half of the total importation consists of bottles filled with liquors, mineral waters, etc., and the principal exporting countries are Germany, France, Austria-Hungary, and the United Kingdom, in the order named. The importation of empty bottles, therefore, is very small in comparison with the domestic output. New York and Baltimore are the chief entry ports, but many unfilled bottles enter at San Francisco, coming over at cheap rates in returning wheat-carrying ships. Boston, New Orleans, and Philadelphia, also have large receipts.

The importation of optical glass has steadily increased, the development of the photographic camera being a strong stimulant. A large portion of the total importation enters in the New York camera district at Rochester, N. Y. Germany furnished 43.7 per cent of the total value in 1900; the United Kingdom, 33.7 per cent; and France, 22.6 per cent. Attempts have been made in this country to make optical glass, but the manufacture has never passed beyond the experimental stage, and at present even experimenting has ceased. The time and care required and the uncertainty as to results attending every melt, in face of the free entry of these products from countries long skilled in the art, make the manufacture of optical glass an unattractive proposition to glass manufacturers in the United States.

A large proportion of the $2,106,084 reported as the value of "all other" glass imports in 1900, was that of fancy decorated Bohemian glassware, much of it made to sell at low prices. The fancy colored and decorated ware, of the Bohemian order, is as yet but a small item in glass manufacture in the United States, although a large quantity is purchased. Increased attention is being given to it, and such success was achieved in its manufacture during the census year by at least one firm, that it will very likely have a vigorous growth during the next few years. Decorated opal or porcelain glass has met with great favor in this country for several years, and in addition to the large quantity of home manufacture, a considerable quantity has been imported, mostly from Germany. Germany has a large trade in chemical glassware for laboratory use, and, with England and France, is finding a rich and almost undisputed field here for that class of ware. The manufacture of chemical ware has been carried on in the United States in a small way, but a recent movement among American chemists in favor of home manufacture has caused more or less agitation among glass manufacturers, and gives promise of leading to a determined attempt on the part of one or two firms to establish the industry on a larger scale in this country.

Great progress has been made in recent years in the manufacture of expensive "art glass" of the highest order. One of the exhibits which attracted considerable attention from glass men of all countries at the Paris Exposition was a new art glass manufactured by a firm in New York city. High-grade lamps, unsurpassed by any manufactured, have been produced in this country. Watch crystals, which are not manufactured in the United States, although it was attempted recently in West Virginia, are imported in large numbers of small aggregate value. The process of manufacture is simple, and it will in time probably form a part of the American industry. A thin round ball or bubble of glass is blown, and from this, with diamond-pointed compasses, the circular disks are cut, which are then placed on properly shaped blocks and bent to the required shape by reheating. Of the total value of "all other" glass imports, 33 per cent comes from Germany, 28.1 per cent from Austria-Hungary, 23.1 per cent from France, 7.8 per cent from the United Kingdom, and 6.3 per cent from Belgium.

Table 11 presents, in addition to the value of imported glass, the value of glass of domestic manufacture exported annually, from 1869 to 1900, inclusive.

The exportation of all other than window glass has almost constantly increased from year to year since 1869, gaining 227.2 per cent in value during that period, and 117.4 per cent during the last decade. The gain in the ten years ending with 1890 over the ten preceding years was $1,830,612, and between 1890 and 1900 over the ten preceding years, $2,922,065. American glassware is exported to nearly every civilized country, 68 countries being reported by the Bureau of Statistics of the Treasury Department in 1900. Canada received 30 per cent of the total value in 1900; Mexico, 14.6 per cent; Australia, 12.8 per cent; Cuba, 8.2 per cent;

and the United Kingdom, 7.3 per cent. An inquiry as to exports was incorporated in the schedule used for the purpose of eliciting complete information as to the articles exported and their destinations; but as the largest part of the exporting is done through regular exporting houses, a very small portion goes direct from the factory with its destination known. The returns from factories, therefore, are very meager, but as far as they go, furnish an idea of the comprehensive scope of the glass export business. Beer and soda bottles, and plain and lettered prescription bottles, pressed tableware, lamp chimneys, and lantern globes constitute the bulk of the exports reported direct from factories. Bottles to the value of $161,300 were reported as exported during the census year by 12 firms, $66,333 of which was the value of beer and soda-water bottles exported to Mexico, where a fair trade has been developed recently in that line of ware. Plain and lettered prescription bottles are a large item in the exports, and 6 firms reported direct shipments to Canada, South and Central America, Mexico, West Indies, Great Britain, France, East Indies, Australia, China, and Japan. The bottle trade with the Philippines and Cuba is very large, principally in the form of bottles filled with beer and liquor. Direct tableware exports were reported by 16 establishments, amounting to $137,982.

American pressed tableware is unexcelled in the markets of the world for color, workmanship, and finish, which make it the closest imitation of real cut ware, at such prices as, quality considered, place it in a class by itself. Export trade is receiving special consideration from some of the largest manufacturers of pressed ware, and the American sample room and traveling agent for pressed glassware are becoming more general abroad. The largest part of the lamp chimney exportation is done by jobbing houses, yet 4 factories reported direct shipments valued at $111,560. About four-fifths of the quantity reported went to South America, where lamp chimneys made in the United States are in high favor. As a result of a recent systematic introduction of the American lamp chimney in England and some of the continental countries, the exports in that direction are steadily increasing and have already reached a very satisfactory figure. American lantern globes are largely used in Central and South America. Canada, South America, and Australia are steadily increasing their consumption of American gas and electric glassware, such as globes and shades. Cathedral or opalescent glass valued at $13,432 was reported as shipped direct from factory to Canada, Germany, England, and France, where, by reason of its superior colors and texture, it is preferred in the construction of art windows.

Exports of window glass show some increase during the last few years, but the lower cost of production in Belgium will, no doubt, continue to restrict, as in the past, the foreign trade of the United States in this commodity. The exports are confined largely to Mexico, British America, and the West Indies. A plan has been discussed to operate the American window factories an extra time during the year at reduced wages to manufacture glass for export exclusively, but it has not met with favor from the workmen and from some of the manufacturers.

FURNACE IMPROVEMENT.

The greatest advance made in the American glass industry in the past decade has been in the improvement of the melting furnace in the direction of greater economy and rapidity in operation. The great feature of this development has been the widespread substitution of the tank for the pot furnace, 48.8 per cent of the total melting capacity of active plants reported during the census year being contained in tank furnaces. In the United States the tank is practically a creation of the last ten years, its standing prior to that time being experimental, though it had been used successfully abroad for a much longer period. So far Germany and Belgium have set the pace for American glass furnace construction.

The glass-melting furnace is a modification of the reverberatory furnace, the materials to be melted being exposed to the action of the flame, but not to the contact of the burning fuel. While numerous modifications exist, the furnaces generally used are of two styles, the pot furnace and the tank furnace. The former is adapted either for the use of open pots or for covered pots, and the latter is either a day tank, intermittent in its melting action, or a continuous tank in which the melting is continuous. The pot furnace contains a number of melting pots, large clay crucibles, each holding, on an average, a ton of molten glass. These pots are arranged immediately inside the breast wall of the furnace with room in the center of the furnace for combustion space. The batch, or mixture of the raw materials, is filled into these pots through an opening in the side of the furnace opposite each pot, and after the melting process is completed, the glass is gathered from the pots through these openings. The pot furnace used in the manufacture of plate glass is an exception in this respect, as the pots are removed bodily from the furnace by a crane and their contents poured on the casting table. In the tank furnace, pots are entirely dispensed with, the glass being melted and held on the hearth of the furnace itself, the flame sweeping across its surface. In the continuous tank there is a supply of molten glass at all times, the batch being filled in at one end and the glass worked out continuously at the other end. The day tank requires a night or day to melt the glass, when it is worked out and the tank again filled with the batch, the operation being similar to the working of a pot furnace. The pot furnaces used in the manufacture of window glass, plate glass, and bottles and jars are either square or oblong in form, and those for flint glass, tableware, etc., are round or oval.

The open-pot furnace for window glass and bottles and jars varies in length according to the number of pots used, its width being about three times the diameter of the pot. The pots vary in number from 4 to 12, generally being 6 or 10, placed in the furnace in 2 rows. Openings at the ends of the furnace permit the removal and replacement of broken pots. The crown of the furnace, forming the top of the combustion chamber, is preferably rather flat, but set high enough to allow adequate flame development and good distribution of the heat between and above the pots. In the direct-fired furnace, the fuel is on a grate set in the space between the 2 rows of pots, somewhat below the level of the bench on which the pots are placed. An arched passage—the cave—runs beneath the furnace for the admission of air to the grate, and there are frequently 2 caves crossing at right angles, so as to admit air from all directions. Neither flues nor regenerators are used when the fuel is fired direct, the draft being regulated by the height of the stack of the furnace, which varies with different fuels employed. In the regenerative gas-fired furnace, the regenerators are so placed that in the event of a pot breaking, the molten glass can not reach them and obstruct the draft. The hot escaping gases from combustion pass from the combustion chamber through the checkerwork of bricks, which take up their heat and soon become very hot. The direction of the flame is reversed and the air for combustion enters through the hot regenerator, while the waste gases pass out through another regenerator. By a reversal of the direction of the flame every twenty or thirty minutes, the hot outgoing waste gases are constantly giving off their heat to the regenerators and the incoming air is constantly returning it to the furnace. In what is styled a recuperative gas-fired furnace, no reversal of the current occurs. The waste gases pass out through a series of thin-walled flues, while the incoming air is admitted through a second series of thin-walled flues, and coming in contact with the first series of flues, absorbs the waste heat. In the gas-fired furnace the air and gas flues rise vertically at either end and terminate in ports at or below the hearth level. The flame traverses the furnace from one end to the other, describing the arc of a circle, or by lessening the draft, it can be made to completely fill the furnace. The open-pot furnace for plate glass is longer than that for window or bottle glass, as it usually holds 20 large pots. There is an opening in the wall of the furnace opposite each pot to allow its removal, bodily, for casting purposes. All plate-glass furnaces are gas fired, the air and gas flues ascending and terminating vertically or coming up vertically and turning so as to enter the furnace horizontally. With the use of the lehr in plate-glass manufacture, the tendency is now toward smaller pots, which increases the number that may be placed in the furnace.

The covered pot furnace for flint glass is generally circular in form. The pots have a hood-like top, which projects to the opening in the breast wall of the furnace and through which the batch is filled in and the glass worked out. This hooded top entirely shields the contents of the pot from the flame. When old or broken pots are to be replaced, the wall of the furnace is removed enough to allow for the passage of the pot. The average life of the covered pot is several months, while that of the open pot is about six weeks; the length of time, however, in each case, may be more or less. It is possible to melt a much better quality of glass in the covered pot than in the open pot, as the hooded top excludes many impurities caused by combustion. The number of covered pots in a furnace is from 8 to 16. In firing the open-pot furnace the aim is to develop in the combustion space between the pots and above them a solid flame, but with the covered pots, the flame must be divided so as to play close around each pot. To this end the flame is drawn from the center of the furnace to a series of flues at the breast wall, a flue being placed between each pot and the adjoining pot. The crown of the furnace comes just above the pots and the stack widens at the base sufficiently to take in the entire diameter of the furnace. The draft flues empty into the stack through the breast wall or through the crown. These furnaces are adapted for recuperative gas firing or direct coal firing. In the oval covered pot furnace the stack is at one side, as with the regenerative tank; greater economy of space in setting the pots is secured as well as better heating results. One method of treatment of the waste heat in a furnace of this kind is to convey it by a series of flues so as to heat the water system that heats the entire factory plant.

The first successful gas-fired glass-melting pot furnace was developed abroad in 1861, the solid fuel being converted into gas in a producer outside of the furnace. Several years were required to introduce this improvement into glass manufacture in this country. This application of gas is one of the chief improvements in modern glass making, making possible a saving in the cost of fuel of fully 50 per cent over the cost with the direct-fired furnace, greatly reducing the time of melt, improving the quality of the glass, and lengthening the life of the pot. However, the disadvantages attending the pot system of melting created a demand for a system to melt and blow the glass continuously; these disadvantages were the time lost with the pot system (fully one-half the time being spent in cooling and settling the metal, working out the glass, and reheating the furnace), and the constant loss incurred by breaking pots, one broken pot so disturbing the rest of the furnace that the full capacity is frequently unavailable for a considerable time. This led to the development of the tank furnace, which was used in Europe in 1861 and improved in 1872. However, the general introduction of the tank into glass manufacture in the United States did not occur until 1888, the successful operation of the continuous tank for window glass at Jeannette, Pa., in that year probably marking its actual introduction into the glass industry of this country. The chief advantages of the tank over the pot furnace are increased production, economy in operation, durability of furnace, regularity of working, and intensity of heat.

The day or intermittent tank is practically a pot furnace with one large open pot comprising the entire hearth, which is a square or oblong box built up of fire clay blocks and well ventilated on the bottom to prevent excessive wear and leakage occurring when the glass gets too hot or soft on the bottom. The air and gas are brought up through flues at one end and the products of combustion are discharged through flues at the other end. Either the regenerative or recuperative system can be used. There were 130 day tanks reported in operation during the census year, 117 of which were in establishments manufacturing bottles and jars and flint ware of all varieties, the average capacity of the tank in such establishments being 6 tons, equal to 6 pots; and 13 in establishments manufacturing skylight glass, glass tiling, rolled glass, and window glass. The greatest obstacle to the successful use of the day tank on flint glass has been the maintenance of color caused by the glass melting principally from the top, leaving the glass at the bottom of the tank less fluid and more refractory, but during the past decade this tank has been so improved that, at present, a very fair grade of so-called flint glass is in many cases being produced, at a great saving in cost over the pot-melting method. With these small tanks the use of gas for fuel probably produces the best results, but oil is being introduced for this purpose with a marked degree of success.[1]

The glass melting capacity of continuous tanks reported active in 1900 was 42.4 per cent of the total for the United States; pot furnaces with a total capacity of 4,300 pots were reported, day tanks of a capacity equivalent to 818 pots, and continuous tanks of a capacity equivalent to 3,775 pots, 2,476 of which were operated on bottles and jars and pressed and blown ware, and 1,299 on building glass. The continuous tank is confined largely to the manufacture of bottles and jars and window glass, 2 shifts being worked in the bottle trade and 3 in the window. The continuous regenerative melting tank contains an immense quantity of molten glass and is always full or nearly so. The window tank is oblong, four or five times as long as the width, with a capacity varying from 6 to 20 rings, each ring being equivalent to a capacity of 3 pots. The bottle tank is much shorter and wider than the window tank, and has an average of about 10 rings, each ring being equivalent to a capacity of 2 pots. The average window tank has 8 rings, or a capacity of 24 blowers or pots. Inside it is 14 feet wide, 70 feet long, and 5 feet deep, and will contain about 425 tons of molten metal. The batch is filled in continuously at one end and drawn, melting as it goes, to the working holes at the other end, where it is worked out. Near the working end of the tank is a floating bridge of prepared clay, extending down about one-fourth of the depth of the tank, which breaks the surface of the mass of glass and acts as a purifier, the completely melted glass passing beneath the floater into the working end of the tank, while the impure glass, which rises to the top, is held in check until properly melted. The wall of the working end of the tank is pierced by working holes through which the glass is gathered, in front of each hole being a deep clay ring stationed in the glass, the refined metal coming into this ring through the bottom and being gathered from the ring by the workman. The bottom and sides of the tank are well ventilated, to lessen the strain on the structure. The regenerators are at either side of the tank foundations, and the flues lead to ports in the side walls or to ports that open through the crown, the flame entering the furnace above the surface of the glass and just beneath the crown. All arrangements are made with a view to developing a nearly continuous sheet of flame.

A modification of the continuous tank for window glass, styled the blow-over tank, was introduced into this country in 1900, though in use abroad for a number of years. There were three or four such plants erected. By the use of the blow-over tank the blow furnace for "warming in" the roller of glass during the blowing operation is dispensed with, as the roller is "warmed in" directly over the mass of molten glass in the tank, the heat of the tank accomplishing this purpose, which effects a saving in fuel of about 50 per cent, for as much fuel is often required for the blow furnaces as for the melting tank. This improvement is made by lengthening the working end of the tank to permit a series of warming-in holes on each side between the floaters and the gathering holes. The results so far obtained with the blow-over tank will probably lead to its general introduction, as, in addition to the great saving in fuel cost, the heat is much more constant and uniform than with the blow furnace.

The use of oil as a fuel for glass melting has greatly increased during the last ten years. One of the most successful methods of oil firing is the use of the cheap, heavy oil of 34 to 40 specific gravity, practically a refinery by-product, with an air pressure of from 2 to 7 ounces per square inch. The air meets the flow of oil at the end of the burner and completely atomizes it in a spray, furnishing just enough oxygen to perfect combustion. Oil is advantageous as a clean fuel of high calorific value and perfect safety, but the cost restricts its general use. Benzine is largely used in certain branches of the glass industry as fuel, being especially well adapted for fuel for glory holes, particularly in the manufacture of bottles, producing an intense uniform heat and requiring but little attention.

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[1] Elements of Glass and Glass Making, Biser, 1900, page 62.

DETAILED STATISTICS OF GLASS MANUFACTURE.

The detailed statistics for the industry as reported are shown in Tables 12, 13, and 14; Table 12 presenting statistics of the entire industry; Table 13, of the manufacture of building glass; and Table 14, of the manufacture of pressed and blown glass, and bottles and jars. These tables present separate totals for each state in which there were 3 or more establishments, and group the statistics for other states, so as not to disclose the operations of individual establishments. The establishments are classified according to the character of the ownership, which shows that in the building glass branch of the industry, 6 were owned by individuals, 11 by partnerships, 102 by corporations, and 5 were of a miscellaneous character; and in the manufacture of pressed and blown glass, and bottles and jars, 23 were owned by individuals, 49 by partnerships, 157 by corporations, and 2 were of a miscellaneous character. The employees are classified so as to show for salaried officials, clerks, etc., and for wage-earners separately the number and salaries or wages of men, women, and children, respectively, and also the average number of wage-earners employed during each month of the year. Separate totals are shown for the different materials, presenting the quantity and cost of each; and the quantity and value of the several products manufactured, and the value of all other products, are given. The number of engines, water wheels, electric motors, and other forms of power in use, with their horsepower, are shown. The establishments are grouped in the tables according to the number of employees in each.

TABLE 12.—GLASS MANUFACTURE, BY STATES: 1900.

	United States.	Illinois.	Indiana.	Maryland.	Massachusetts.	Missouri.	New Jersey.	New York.	Ohio.	Pennsylvania.	West Virginia.	All other states.[1]
Number of establishments	355	6	110	7	5	3	26	27	28	119	16	8
Character of organization:												
Individual	29	....	7	1	....	....	4	3	3	10	1	....
Firm and limited partnership	60	1	5	2	1	....	4	6	4	31	3	3
Incorporated company	259	5	93	4	4	3	18	17	21	77	12	5
Miscellaneous	7	....	5	....	....	....	....	1	....	1	....	....
Capital:												
Total	$61,423,903	$2,181,801	$12,775,389	$581,086	$258,949	$2,198,316	$5,397,662	$2,242,834	$5,451,513	$28,287,187	$1,338,084	$711,082
Land	$4,771,476	$66,657	$626,095	$49,618	$33,000	$251,081	$330,136	$242,675	$440,375	$2,589,897	$75,142	$66,500
Buildings	$16,954,293	$524,764	$4,132,329	$144,576	$50,047	$668,346	$1,164,071	$397,004	$1,310,859	$8,021,796	$397,301	$143,200
Machinery, tools, and implements	$14,247,283	$118,289	$2,936,890	$66,559	$35,150	$878,589	$353,600	$300,232	$1,491,631	$7,683,311	$234,532	$148,500
Cash and sundries	$25,450,851	$1,472,091	$5,080,075	$320,333	$140,752	$400,300	$3,549,855	$1,302,923	$2,208,648	$9,992,183	$631,109	$352,582
Proprietors and firm members	170	1	24	4	2	....	18	17	9	81	6	8
Salaried officials, clerks, etc.:												
Total number	2,268	75	509	31	39	26	317	117	199	842	85	28
Total salaries	$2,792,376	$110,100	$649,227	$38,976	$28,060	$47,448	$284,960	$139,698	$249,029	$1,110,383	$97,551	$36,944
Officers of corporations—												
Number	389	12	119	6	8	4	51	29	30	107	19	4
Salaries	$936,835	$36,260	$271,147	$9,710	$9,869	$17,400	$83,540	$56,054	$68,639	$345,816	$31,100	$7,300
General superintendents, managers, clerks, etc.—												
Total number	1,879	63	390	25	31	22	266	88	169	735	66	24
Total salaries	$1,855,541	$73,840	$378,080	$29,266	$18,191	$30,048	$201,420	$83,644	$180,390	$764,567	$66,451	$29,644
Men—												
Number	1,647	59	342	23	22	19	234	81	139	651	53	24
Salaries	$1,745,140	$71,320	$353,093	$27,944	$15,326	$28,538	$188,740	$80,082	$167,888	$722,108	$60,457	$29,644
Women—												
Number	232	4	48	2	9	3	32	7	30	84	13	....
Salaries	$110,401	$2,520	$24,987	$1,322	$2,865	$1,510	$12,680	$3,562	$12,502	$42,459	$5,994	....
Wage-earners, including pieceworkers, and total wages:												
Greatest number employed at any one time during the year	71,713	3,904	18,523	990	534	1,051	7,421	3,499	6,233	26,043	2,375	1,140
Least number employed at any one time during the year	53,660	3,654	14,669	751	373	720	4,637	2,373	4,307	19,154	2,000	1,022
Average number	52,818	3,304	13,015	742	387	650	5,383	2,556	4,546	19,420	1,949	866
Total wages	$27,084,710	$1,621,286	$7,226,047	$339,518	$188,674	$341,375	$2,462,745	$1,305,264	$2,067,384	$10,287,491	$789,422	$455,504
Men, 16 years and over—												
Average number	42,173	2,607	10,910	562	343	648	4,366	2,201	3,505	15,136	1,319	576
Wages	$24,901,233	$1,496,891	$6,808,042	$313,920	$179,236	$340,825	$2,278,306	$1,239,971	$1,844,958	$9,338,261	$657,984	$402,839
Women, 16 years and over—												
Average number	3,529	148	634	54	19	....	170	73	405	1,546	468	12
Wages	$840,001	$28,456	$129,808	$8,673	$4,392	....	$32,726	$17,831	$96,017	$414,250	$103,748	$4,100
Children, under 16 years—												
Average number	7,116	549	1,471	126	25	2	847	282	636	2,738	162	278
Wages	$1,343,476	$95,939	$288,197	$16,925	$5,046	$550	$151,713	$47,462	$126,409	$534,980	$27,690	$48,565
Average number of wage-earners, including pieceworkers, employed during each month:												
Men, 16 years and over—												
January	51,282	3,023	13,956	636	390	526	5,344	2,488	4,132	18,680	1,407	700
February	51,730	3,020	14,140	648	368	518	5,384	2,393	4,169	18,928	1.462	700
March	52,146	3,015	13,847	699	330	516	5,410	2,607	4,488	19.033	1.467	734
April	52,044	2,995	14,017	713	303	716	4,848	2,720	4,527	19,023	1,462	720
May	50,662	2,954	13,728	710	323	969	5,014	2,671	4,290	17,972	1.414	617
June	45,847	2,806	12,687	668	310	964	4,641	2,348	3,244	16,483	1.150	546
July	17,829	662	3,921	193	222	649	1,419	968	1,209	7,874	507	205
August	20,468	665	4,183	225	239	693	969	1,033	1,632	9,410	1.214	205
September	35,245	3,040	8,165	481	344	538	3,931	1,841	3,262	11,773	1.377	493
October	40,878	3,035	10,306	573	373	558	4,765	2,244	3,531	13,502	1,431	560
November	43,042	3,051	10,861	564	449	555	5,316	2,501	3,541	14,042	1,448	714
December	44,903	3,018	11,112	634	465	578	5,352	2,593	4.032	14.914	1,487	718

[1] Includes establishments distributed as follows: California, 1; Colorado, 1, Delaware, 1; Georgia, 1; Michigan, 1; Virginia, 2; Wisconsin, 1.

TABLE 12.—GLASS MANUFACTURE, BY STATES: 1900—Continued.

	United States.	Illinois.	Indiana.	Maryland.	Massachusetts.	Missouri.	New Jersey.	New York.	Ohio.	Pennsylvania.	West Virginia.	All other states.[1]
Average number of wage-earners, including pieceworkers, employed during each month—Continued.												
Women, 16 years and over—												
January	3,820	179	792	53	15	....	153	71	431	1,665	448	13
February	3,879	177	758	58	19	....	159	67	439	1,731	458	13
March	3,984	177	810	62	19	....	166	83	487	1,704	463	13
April	3,890	177	806	57	20	....	160	90	479	1,625	463	13
May	3,486	167	625	58	20	....	181	93	427	1,469	433	13
June	3,343	152	623	54	18	....	182	84	402	1,384	428	16
July	1,850	24	197	25	8	....	147	44	193	1,020	176	16
August	2,530	24	253	50	14	....	93	60	251	1,262	508	15
September	3,428	172	442	59	21	....	135	56	414	1,572	557	....
October	3,907	171	715	61	20	....	175	67	447	1,694	557	....
November	4,135	177	801	61	24	....	261	80	451	1,699	565	16
December	4,096	177	782	56	24	....	223	79	445	1,733	561	16
Children, under 16 years—												
January	8,301	667	1,813	132	34	....	996	300	829	3,040	160	330
February	8,463	659	1,878	136	35	....	993	286	840	3,139	167	330
March	8,537	659	1,884	188	24	....	983	300	832	3,142	176	349
April	8,644	661	1,911	197	24	....	965	334	819	3,210	176	347
May	7,341	646	1,306	186	25	6	986	350	549	2,749	171	367
June	7,082	646	1,196	199	25	6	963	333	585	2,663	169	297
July	2,397	....	524	5	6	8	169	116	82	1,325	77	85
August	3,350	....	694	5	6	6	157	141	246	1,871	139	85
September	6,146	650	1,101	60	24	....	789	239	464	2,393	182	244
October	8,091	660	1,748	137	30	....	969	292	789	3,042	180	244
November	8,496	671	1,802	128	32	....	1,124	329	797	3,107	177	329
December	8,544	667	1,800	136	35	....	1,071	366	796	3,169	173	331
Miscellaneous expenses—												
Total	$3,588,641	$210,588	$690,165	$26,065	$14,243	$98,119	$241,655	$145,505	$155,512	$1,867,879	$112,791	$26,119
Rent of works	$29,195	....	$780	....	$500	$154	$683	$8,945	$68	$12,465	$400	$5,200
Taxes, not including internal revenue	$236,338	$9,556	$59,550	$2,040	$3,155	$6,242	$21,663	$8,122	$17,260	$100,838	$4,804	$3,108
Rent of offices, insurance, interest, and all sundry expenses not hitherto included	$3,264,149	$201,032	$625,835	$24,025	$10,588	$91,723	$212,900	$115,369	$138,184	$1,723,445	$105,637	$15,411
Contract work	$58,959	....	$4,000	....	....	....	$6,409	$13,069	....	$31,131	$1,950	$2,400
Materials used:												
Aggregate cost	$16,731,009	$674,008	$4,582,141	$151,500	$137,185	$231,515	$1,488,700	$899,590	$1,253,164	$6,435,463	$593,251	$284,492
Glass sand, tons	581,720	32,978	179,367	3,493	1,622	10,366	81,260	22,820	37,707	191,859	10,025	10,223
Cost	$846,822	$33,381	$241,075	$6,166	$6,355	$8,613	$78,521	$46,117	$67,035	$329,465	$14,203	$15,891
Soda ash (carbonate of soda), tons	157,779	12,017	48,629	1,601	194	3,048	20,630	7,508	11,072	46,398	2,847	3,835
Cost	$2,259,939	$164,827	$686,471	$23,276	$5,342	$47,554	$310,641	$113,586	$156,797	$639,152	$43,724	$68,569
Salt cake (sulphate of soda), tons	53,257	....	14,371	....	125	226	697	1,453	1,751	34,297	337	....
Cost	$518,590	....	$183,232	....	$1,625	$2,311	$7,478	$13,605	$18,428	$287,311	$4,600	....
Nitrate of soda, tons	10,770	440	2,329	149	24	....	1,314	548	1,259	4,330	307	70
Cost	$320,937	$13,720	$75,243	$5,000	$830	....	$21,165	$19,174	$39,634	$132,389	$10,982	$2,800
Limestone, tons	91,015	4,815	27,993	185	100	4,112	8,577	2,462	3,356	38,309	450	656
Cost	$181,717	$9,912	$47,882	$578	$225	$8,566	$25,471	$6,826	$6,536	$71,110	$825	$3,786
Lime, hundredweight	794,679	45,387	230,148	15,128	559	610	198,923	32,819	75,638	147,975	15,728	31,764
Cost	$147,901	$10,175	$37,599	$1,492	$112	$140	$26,873	$8,885	$14,712	$37,946	$4,057	$5,910
Arsenic, pounds	2,349,261	45,607	837,487	4,621	7,789	24,233	102,490	101,570	228,587	896,074	80,503	20,300
Cost	$112,630	$2,173	$40,848	$207	$370	$1,217	$4,912	$4,942	$11,751	$41,295	$3,837	$1,078
Carbon, tons	4,155	90	1,883	....	15	18	20	51	133	1,926	13	6
Cost	$17,000	$1,018	$6,557	....	$100	$540	$406	$544	$660	$6,950	$155	$70
Manganese, pounds	1,493,538	59,838	521,980	11,167	8,101	33,000	143,465	90,721	76,117	457,581	58,944	32,624
Cost	$57,493	$1,960	$19,655	$566	$207	$825	$5,674	$3,800	$3,672	$17,474	$2,239	$1,421
Litharge (red lead), pounds	8,386,106	115,600	1,482,887	36,982	364,448	....	72,049	822,130	2,063,000	3,143,727	285,283	....
Cost	$490,200	$6,242	$76,215	$1,857	$24,197	....	$3,918	$48,137	$117,035	$191,716	$20,583	....
Potash or pearlash, pounds	4,406,211	....	453,481	75,000	207,967	....	60,270	469,186	850,171	1,938,334	351,802	....
Cost	$186,847	....	$18,564	$3,000	$8,994	....	$2,866	$20,503	$34,129	$82,234	$16,557	....
Grinding sand, tons	265,438	....	71,152	....	....	4,743	433	50	6,897	182,117	46	....
Cost	$166,040	....	$37,533	....	....	$1,897	$519	$120	$2,520	$123,186	$265	....
Rouge, pounds	837,536	....	267,345	....	....	20,980	1,300	....	14,987	532,524	400	....
Cost	$24,747	....	$9,061	....	....	$693	$41	....	$897	$13,971	$84	....
Plaster of paris, tons	23,066	....	7,660	....	....	596	....	10	611	14,184	4	1
Cost	$108,531	....	$35,104	....	....	$3,799	....	$71	$1,311	$68,171	$57	$18
Fire clay, or pot clay, pounds	32,151,017	642,000	8,624,298	245,900	66,158	426,520	2,108,845	1,033,200	2,549,910	15,926,246	154,940	373,000
Cost	$221,183	$5,687	$64,394	$1,390	$720	$2,795	$13,875	$8,373	$7,055	$113,822	$1,587	$1,485
Pots, not including those made at works, number	8,941	309	2,429	164	110	58	366	475	1,199	3,461	350	20
Cost	$381,147	$17,680	$101,884	$7,286	$5,175	$2,030	$12,517	$17,520	$61,971	$135,765	$17,999	$1,320
Flattening stones, number	272	....	79	....	4	....	14	1	24	146	4	....
Cost	$16,344	....	$5,010	....	$200	....	$315	$60	$1,550	$9,049	$160	....
Fuel—												
Total cost	$3,203,146	$155,400	$355,300	$47,980	$33,047	$75,689	$445,828	$227,158	$249,405	$1,421,710	$88,905	$102,724
Natural gas	$1,575,278	....	$351,553	....	....	....	....	$9,190	$110,616	$1,016,903	$87,016	....
Oil, gallons	12,690,856	1,663,301	624	293,107	371,867	50,000	5,098,181	1,347,692	1,250,750	1,116,129	18,650	1,480,555
Cost	$409,158	$41,084	$115	$10,051	$15,619	$2,000	$159,327	$48,345	$31,899	$50,227	$585	$49,906
Coal, tons	755,463	114,675	952	17,395	4,136	45,293	104,926	68,959	77,409	300,484	1,271	19,963
Cost	$1,074,074	$95,312	$2,616	$32,804	$14,942	$71,719	$219,362	$158,752	$102,461	$326,369	$1,304	$48,433
All other fuel	$144,636	$19,004	$1,016	$5,125	$2,486	$1,970	$67,139	$10,871	$4,429	$28,211	....	$4,385
Rent of power and heat	$62	....	....	....	....	....	....	....	....	$62	....	....
Lumber, casks, barrels, boxes, and nails	$2,778,025	$104,589	$941,834	$15,868	$12,191	$17,840	$193,850	$127,827	$211,651	$1,026,513	$197,050	$18,812
Cartons, wrapping paper, straw, and hay	$612,602	$22,571	$290,525	$3,026	$4,193	$2,773	$22,390	$22,305	$49,770	$161,012	$32,562	$1,475
Caps, metal trimmings, and rubber supplies	$1,522,917	$31,073	$747,574	$10,494	$6,816	....	$79,359	$67,111	$61,212	$405,045	$101,983	$12,250
Supplies used in repairs on tanks and furnaces	$531,916	$36,659	$145,667	$2,107	$2,803	$14,073	$47,089	$30,524	$19,174	$205,665	$16,422	$11,733
Mill supplies	$138,434	$1,126	$56,846	$2,567	$692	$1,938	$3,707	$3,528	$9,064	$49,169	$8,690	$1,107
All other materials	$991,751	$31,672	$137,133	$12,463	$20,679	$30,906	$109,335	$78,950	$43,746	$458,507	$63,628	$4,732
Freight	$894,088	$24,143	$220,935	$6,177	$2,012	$7,316	$71,950	$29,924	$63,449	$406,774	$32,097	$29,311

[1] Includes establishments distributed as follows: California, 1; Colorado, 1; Delaware, 1; Georgia, 1; Michigan, 1; Virginia, 2; Wisconsin, 1.

TABLE 12.—GLASS MANUFACTURE, BY STATES: 1900—Continued.

	United States.	Illinois.	Indiana.	Maryland.	Massachusetts.	Missouri.	New Jersey.	New York.	Ohio.	Pennsylvania.	West Virginia.	All other states.[1]
Products:												
Aggregate value	$56,539,712	$2,834,398	$14,757,883	$557,895	$418,458	$765,564	$5,093,822	$2,756,978	$4,547,083	$22,011,130	$1,871,795	$924,706
Building glass—												
Total value	$17,096,234	$24,000	$5,711,948	$103,262	$16,200	$505,564	$274,011	$346,790	$671,422	$9,213.545	$101.242	$128,250
Window glass, 50-foot boxes	4,341,282	4,000	1,701,729	49,669	6,000		124,541	89,522	200,854	2,068,340	40,144	56,483
Value	$10,879,355	$24,000	$4,176,587	$103,262	$15,000		$267,611	$243,085	$519,187	$5,301.131	$101,242	$128.250
Plate glass—												
Total cast, square feet	34,758,994		8,553,838			5,628,860		543,282	486,340	19,546,674		
Rough sold, square feet	628,684		31,917			16,862				579,905		
Value	$75,887		$4,780			$3,075				$68,032		
Polished plate made, square feet	16,883,578		5,177,160			455,222			373,946	10,877,250		
Value	$5,158,598		$1,415,224			$152,062			$149,578	$3.441,734		
Cathedral, square feet	8,846,361		2,000,000			5,103,079		543,282		1,200,000		
Value	$567,252		$100,000			$349,558		$46,694		$71,000		
Skylight, square feet	3,679,694		5,616			10,976			26,566	3,636,536		
Value	$165,086		$357			$869			$2,657	$161,203		
Wire, square feet	1,295,504									1,295,504		
Value	$129,051									$129,051		
All other building glass	$121,005		$15,000		$1,200		$6,400	$57,011		$41,394		
Pressed and blown glass—												
Total value	$17,076,125	$131,618	$2,691,787	$100,000	$382,091		$21,300	$1,173,784	$2,738,289	$8,453,550	$1,379,706	$4,000
Tableware, 100 pieces	655,141		126,162						150,992	364,770	13,217	
Value	$2,617,784		$291,060						$668,469	$1,585,870	$72,385	
Jellies, tumblers, and goblets, dozens	8,544,050		3,050,595	340,000					1,681,584	3,112,588	359,283	
Value	$2,007,386		$630,485	$100,000					$392,612	$793,902	$90,387	
Lamps, dozens	807,765		81,972		2,020			15,599	191,084	455,543	61,547	
Value	$1,498,675		$43,116		$4,000			$7,447	$185,297	$983,452	$275,363	
Chimneys, dozens	6,901,192	173,931	3,113,228		84,000			186,800	1,508,114	1,835,119		
Value	$2,719,583	$131,618	$1,196,996		$33,000			$96,707	$622,721	$638,541		
Lantern globes, dozens	1,044,816		547,971		2,000			162,038	142,800	58,275	131,732	
Value	$497,021		$176,150		$1,800			$189,629	$69,589	$26,920	$32,933	
Shades, globes, gas and electric goods, dozens	2,673,854		15,052		23,300		41,666	312,500	1,397,824	856,125	27,387	
Value	$2,497,885		$19,044		$40,000		$6,500	$520,000	$398,420	$1,452,248	$61,673	
Blown tumblers, stemware, and bar goods, dozens	6,127,367		112,163						214,072	3,512,552	2,288,580	
Value	$1,598,652		$37,701						$53,368	$1,107,489	$400,094	
Opal ware, dozens	3,750,443		244,873		3,000			1,000	96,597	2,925,545	479,428	
Value	$1,581,731		$90,322		$4,000			$1,500	$51,656	$1,214,472	$219,781	
Cut glass, dozens	134,726		325		3,332				2,900	56,800	71,369	
Value	$672,463		$600		$146,613				$126,000	$311,189	$88,061	
All other pressed and blown glass	$1,384,945		$206,313		$152,678		$14,800	$358,501	$170,157	$339,467	$139,029	$4,000
Bottles and jars—												
Total value	$21,676,791	$2,678,780	$6,327,468	$346,633	$20,167	$260,000	$4,452,219	$1 195,276,	$1,058,955	$4,162,990	$381,847	$792,456
Prescription vials and druggists' wares, gross	2,423,932	265,918	624,128	20,000			731,107	81,803	76,409	551,236	4,004	69.327
Value	$4,665,697	$404,799	$1,184,397	$94,633			$1,306,316	$203,734	$155,377	$1,170,061	$8,889	$137,491
Beers, sodas, and minerals, gross	1,351,118	406,037	109,194	13,004	128	70,000	108,247	134,364	219,422	147,145	25,000	118.577
Value	$5,075,068	$1,332,842	$347,836	$120,212	$626	$260,000	$408,661	$495,398	$637,428	$01,129	$92,000	$478,936
Liquors and flasks, gross	985,374	31,168	604,798	5,000	6,298		64,140	44,171	16,400	142,518	43,058	27,823
Value	$2,403,447	$131,869	$1,207,519	$20,000	$19,541		$153,165	$110,221	$57,350	$448,182	$169,852	$85,748
Milk jars, gross	146,142	7,500	19,561				19,798	6,938	6,000	80,485	4,600	1,260
Value	$729,008	$37,500	$55,344				$107.431	$33,863	$30,000	$434,310	$23,000	$7,560
Fruit jars, gross	789,298	1,500	559,549				61,871	31,235	2,000	115,000	14,643	3,500
Value	$2,935,036	$9,000	$2,106,250				$192,467	$128,965	$8,000	$436,104	$43,750	$10,500
Patent and proprietary, gross	1,296,131	302,708	244,343	500			601,276	57,224	20,000	55,080		15.000
Value	$2,602,976	$495,597	$378,301	$1,500			$1,399,042	$120,543	$35,800	$142,193		$30,000
Packers and preservers, gross	784,588	80,739	247,731	5,007			278,960	11,430	25,000	113,546	10,242	11,933
Value	$2,119,221	$195,691	$686,092	$15,021			$620,869	$33,706	$100,000	$419,947	$20,356	$27,539
Demijohns and carboys, dozens	83,243	29,136					18,689	10,929		17,815		6,674
Value	$206,061	$48,984					$86,645	$18,896		$36,854		$14,682
All other bottles and jars	$940,277	$22,498	$361,729	$95,267			$177,623	$49,950	$35,000	$174.210	$24,000	
Value of all other products	$690,562		$26,680	$8,000			$346,292	$41,128	$78,417	$181,045	$9,000	
Comparison of products:												
Number of establishments reporting for both years	252	6	63	7	3	3	23	23	21	88	10	5
Value for census year	$47,184,649	$2,834,398	$11,157,894	$557,895	$382,091	$765,564	$4,927,447	$2,638,902	$4,138,150	$17,347,849	$1,628,027	$806,432
Value for preceding business year	$41,959,668	$2,297,679	$10,056,153	$532,723	$430,549	$1,034,253	$4,539,963	$2,350,494	$3,316,665	$15,384,075	$1,371,352	$645,762
Equipment and characteristics of works:												
Pot furnaces—												
Operated, number	391	9	116	10	4	4	27	24	37	143	14	3
Pots, number	4,300	117	1,220	91	38	60	200	200	444	1,758	144	28
Idle, number	60	1	9	2	3	3	6	5	5	25	1	
Pots, number	807	12	134	16	27	50	55	47	95	359	12	
Tanks—												
Continuous—												
Operated, number	192	11	71			3	31	14	12	43		7
Rings, number	1,671	133	564			20	293	115	95	404		47
Pot capacity, number	3,775	266	1,307			43	610	230	212	1,013		94
Idle, number	14		4			2	6			1		1
Rings, number	79		12			15	40			8		4
Pot capacity, number	158		24			30	80			16		8

[1] Includes establishments distributed as follows: California, 1; Colorado, 1; Delaware, 1; Georgia, 1; Michigan, 1; Virginia, 2; Wisconsin, 1.

Table 12.—GLASS MANUFACTURE, BY STATES: 1900—Continued.

	United States.	Illinois.	Indiana.	Maryland.	Massachusetts.	Missouri.	New Jersey.	New York.	Ohio.	Pennsylvania.	West Virginia.	All other states.[1]
Equipment and characteristics of works—Continued.												
Intermittent or day—												
Operated, number	130	7	33	1	1		12	7	3	44	19	3
Tons capacity, number	818	40	208	6	90		72	49	13	232	85	23
Pot capacity, number	818	40	208	6	90		72	49	13	232	85	23
Idle, number	17		4				2	1	3	5	1	1
Tons capacity, number	83		12				7	3	12	42	5	2
Pot capacity, number	83		12				7	3	12	42	5	2
Building glass—												
Flattening ovens, number	285	1	116	2	1		6	5	12	138	2	2
Monkey ovens, number	2	2										
Blow furnaces, number	259		135		1			10	15	94	4	
Casting tables, number	100	4	17			14		5	3	57		
Annealing ovens, number	869		258			98		5	23	485		
Bending ovens, number	9		5							4		
Lehrs, number	302		115	2	1	2	5	12	13	147	3	2
Clay grinding mills, number	63		22	2	1	1	3	6	3	23	1	1
Grinding machines, number	227		61	1		21		3	12	129		
Polishing machines, number	294		86			24			10	174		
Sand-blast machines, number	5		1					1		3		
Glassware and bottles—												
Shops, number	3,978	427	1,397	67	38	26	718	312	613	144	158	78
Glory holes, number	1,419	146	351	24	16	6	301	66	93	351	28	37
Annealing ovens, number	1,540	289	161	21	15	32	266	126	121	395	18	96
Lehrs, number	1,025	31	321	18	12		95	55	102	323	59	9
Decorating kilns, number	105		6	1	8			1	27	55	7	
Decorating lehrs, number	23		1						4	15	3	
Presses, hand, number	915	13	197	7	9		55	49	125	402	57	1
Presses, mechanical, number	49		4							42	3	
Blowing machines, number	169	1	80				4	1	18	65		
Finishing machines, number	140	2	33				1	2	59	42	1	
Crimping machines, number	494	1	169		5			32	35	252		
Mechanical polishers, number	16				1		1	1	1	12		
Sand-blast machines, number	68	1	8		3		1	9	10	27	9	
Grinding machines for fruit-jar tops, number	137	3	29	4			22	9	5	54	10	1
Clay-grinding mills, number	8		1				1		2	4		
Mechanical stokers, number	79						3	14	8	52		2
Horses and mules, number	409	23	21	13	8	9	98	49	18	134	6	30
Wagons, carts, and drays, number	407	24	23	17	9	7	111	47	18	126	6	19
Power:												
Number of establishments reporting	330	6	99	7	4	3	25	25	27	112	14	8
Total horsepower	58,929	700	11,386	240	199	3,592	1,756	1,127	7,326	30,956	958	689
Owned—												
Engines—												
Steam, number	753	14	187	9	4	17	69	33	38	353	17	12
Horsepower	49,791	700	10,333	230	100	3,110	1,681	1,017	3,426	27,732	773	689
Gas, or gasoline, number	84		23		1		1	1	13	41	4	
Horsepower	2,364		585		7		5	50	235	1,322	160	
Water wheels, number	2				1					1		
Horsepower	27				12					15		
Electric motors, number	178		18	1	1	15			45	97	1	
Horsepower	5,986		468	10	40	482			3,605	1,361	20	
Other power, number	25						4	4	6	10	1	
Horsepower	705						70	60	60	510	5	
Rented—												
Electric, horsepower	44				40					4		
Other kind, horsepower	12									12		
Furnished to other establishments, horsepower	10							10				
Establishments classified by number of persons employed, not including proprietors and firm members:												
Total number of establishments	355	6	110	7	5	3	26	27	28	119	16	8
Under 5	1										1	
5 to 20	5	1	2						1	1		
21 to 50	33		7		1		3	9	2	8	3	
51 to 100	93		39	3	2		5	7	3	24	5	5
101 to 250	139	1	43	3	2	1	11	7	12	55	3	1
251 to 500	58	2	14	1		2	3	4	8	18	4	2
501 to 1,000	21		4				3		2	12		
Over 1,000	5	2	1				1			1		

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[1] Includes establishments distributed as follows: California, 1; Colorado, 1; Delaware, 1; Georgia, 1; Michigan, 1; Virginia, 2; Wisconsin, 1.

TABLE 13.—BUILDING GLASS, BY STATES: 1900.

	United States.	Indiana.	New Jersey.	New York	Ohio.	Pennsylvania.	All other states.[1]
Number of establishments	124	51	4	7	7	46	9
Character of organization:							
Individual	6	2	1		2		1
Firm and limited partnership	11		1	1		7	2
Incorporated company	102	45	2	6	5	38	6
Miscellaneous	5	4				1	
Capital:							
Total	$26,617,122	$7,080,415	$218,990	$334,035	$2,039,134	$14,661,120	$2,283,428
Land	$2,170,678	$385,283	$28,000	$16,450	$212,194	$1,275,513	$253,238
Buildings	$9,020,800	$2,810,636	$81,000	$71,500	$486,931	$4,831,176	$739,557
Machinery, tools, and implements	$9,523,538	$2,162,680	$14,500	$38,150	$991,209	$5,425,846	$891,153
Cash and sundries	$5,902,106	$1,721,816	$95,490	$207,935	$348,800	$3,128,585	$399,480
Proprietors and firm members	25	2	4	6	2	8	3
Salaried officials, clerks, etc.:							
Total number	615	224	8	11	25	307	40
Total salaries	$811,983	$274,105	$6,326	$15,160	$22,570	$435,015	$58,807
Officers of corporations—							
Number	87	32	1	2	5	41	6
Salaries	$311,672	$105,898	$1,200	$4,700	$7,825	$173,449	$18,600
General superintendents, managers, clerks, etc.—							
Total number	528	192	7	9	20	266	34
Total salaries	$500,311	$168,207	$5,126	$10,460	$14,745	$261,566	$40,207
Men—							
Number	485	178	6	8	18	245	30
Salaries	$476,169	$159,904	$4,970	$10,096	$14,295	$248,707	$38,197
Women—							
Number	43	14	1	1	2	21	4
Salaries	$24,142	$8,303	$156	$364	$450	$12,859	$2,010
Wage-earners, including pieceworkers, and total wages:							
Greatest number employed at any one time during the year	19,343	6,512	389	313	1,021	10,031	1,077
Least number employed at any one time during the year	16,059	5,519	242	263	912	8,379	744
Average number	11,902	3,912	230	228	477	6,459	596
Total wages	$9,029,673	$3,251,819	$163,245	$164,291	$376,006	$4,706,720	$367,592
Men, 16 years and over—							
Average number	11,801	3,908	230	226	477	6,368	592
Wages	$8,999,613	$3,250,119	$163,245	$163,979	$376,006	$4,679,801	$366,463
Women, 16 years and over—							
Average number	20					20	
Wages	$4,901					$4,901	
Children, under 16 years—							
Average number	81	4		2		71	4
Wages	$25,159	$1,700		$312		$22,018	$1,129
Average number of wage-earners, including pieceworkers, employed during each month:							
Men, 16 years and over—							
January	16,693	5,865	357	297	787	8,840	547
February	16,919	6,012	357	293	780	8,985	492
March	16,743	5,461	357	305	955	9,175	490
April	16,987	5,457	373	292	951	9,224	690
May	17,152	5,806	384	284	932	8,803	943
June	14,408	5,370	249	91	4	7,846	848
July	5,584	1,558	37	59	4	3,243	683
August	5,717	1,545	23	45	10	3,367	727
September	5,761	1,922	18	169	192	3,218	242
October	7,578	2,447	105	285	229	4,086	426
November	8,241	2,605	240	296	229	4,402	469
December	9,823	2,845	260	297	649	5,227	545
Women, 16 years and over—							
January	25					25	
February	24					24	
March	27					27	
April	22					22	
May	18					18	
June	18					18	
July	13					13	
August	15					15	
September	17					17	
October	21					21	
November	18					18	
December	24					24	
Children, under 16 years—							
January	91	3		2		82	4
February	94	5		2		83	4
March	91	4		2		81	4
April	93	5		2		82	4
May	92	5		2		75	10
June	91	6		2		73	10
July	76	4				64	8
August	80	4		2		68	6
September	58	4		2		52	
October	62	3		2		57	
November	69	3		2		64	
December	77	4		2		71	
Miscellaneous expenses:							
Total	$1,365,865	$348,665	$12,141	$14,569	$19,505	$867,168	$103,817
Rent of works	$6,314			$1,200		$4,460	$654
Taxes, not including internal revenue	$104,969	$32,387	$841	$810	$2,291	$61,989	$6,651
Rent of offices, insurance, interest, and all sundry expenses not hitherto included	$1,243,457	$316,278	$11,300	$11,882	$17,214	$790,271	$96,512
Contract work	$11,125			$677		$10,448	
Materials used:							
Aggregate cost	$4,679,084	$1,319,675	$86,720	$120,748	$158,526	$2,697,041	$296,374
Glass sand, tons	177,966	59,746	2,763	2,977	5,851	95,176	11,453
Cost	$298,879	$102,019	$2,833	$3,773	$7,836	$172,003	$10,415
Soda ash (carbonate of soda), tons	25,500	8,037	615	59	666	13,206	2,917
Cost	$338,534	$106,833	$11,396	$1,433	$9,669	$168,022	$41,181
Salt cake (sulphate of soda), tons	52,789	14,158	500	1,453	1,751	34,239	688
Cost	$512,835	$180,018	$5,700	$13,605	$18,428	$286,548	$8,536
Nitrate of soda, tons	614	50		23		541	
Cost	$9,262	$1,875		$1,056		$6,331	
Limestone, tons	60,274	18,911	350	917	1,982	34,910	3,204
Cost	$106,540	$31,987	$850	$1,621	$3,102	$62,380	$6,600
Lime, hundredweights	125,030	12,060	72,922		3,150	20,185	16,713
Cost	$12,315	$1,745	$2,373		$482	$3,919	$3,795

[1] Includes establishments distributed as follows: Illinois, 1; Maryland, 2; Massachusetts, 1; Missouri, 2; West Virginia, 2; Delaware, 1.

TABLE 13.—BUILDING GLASS, BY STATES: 1900—Continued.

	United States.	Indiana.	New Jersey.	New York.	Ohio.	Pennsylvania.	All other states.[1]
Materials used—Continued.							
Aggregate cost—Continued.							
Arsenic, pounds	1,321,130	517,839	5,085	40,552	105,243	610,807	41,601
Cost	$63,067	$25,867	$280	$2,066	$4,875	$27,923	$2,056
Carbon, tons	3,973	1,847	......	47	133	1,912	34
Cost	$14,499	$6,135	......	$310	$660	$6,749	$645
Manganese, pounds	68,600	13,000	......	1,200	......	20,400	34,000
Cost	$2,316	$735	......	$63	......	$643	$875
Litharge (red lead), pounds	35,521	1,000	......	31,221	......	2,700	600
Cost	$2,273	$60	......	$2,023	......	$148	$42
Potash or pearlash, pounds	70,383	10,000	......	54,748	......	5,635	......
Cost	$3,704	$510	......	$2,951	......	$243	......
Grinding sand, tons	263,933	70,853	......	......	6,800	181,537	4,743
Cost	$160,305	$36,811	......	......	$2,040	$119,557	$1,897
Rouge, pounds	835,749	267,345	......	......	14,900	532,524	20,980
Cost	$24,448	$9,061	......	......	$723	$13,971	$693
Plaster of paris, tons	22,980	7,626	......	......	600	14,157	597
Cost	$107,434	$34,610	......	......	$1,200	$67,807	$3,817
Fire clay or pot clay, pounds	23,510,700	7,282,228	196,840	288,750	1,603,910	13,365,852	773,120
Cost	$170,522	$57,310	$2,148	$2,438	$4,749	$97,832	$6,045
Pots (not including those made at works), number	3,830	1,482	65	332	336	1,366	249
Cost	$101,061	$45,035	$1,300	$10,395	$9,110	$25,641	$9,580
Flattening stones, number	272	79	14	1	24	146	8
Cost	$16,344	$5,010	$315	$60	$1,550	$9,049	$360
Fuel—							
Total cost	$1,119,022	$195,376	$30,343	$42,741	$35,772	$710,415	$104,375
Natural gas	$751,354	$193,590	......	......	$11,212	$535,070	$11,482
Oil, gallons	723,654	489	133,414	54,171	113	177,256	358,211
Cost	$23,161	$78	$4,070	$2,742	$25	$5,679	$10,567
Coal, tons	269,611	432	12,406	20,769	28,593	161,368	46,043
Cost	$335,856	$1,138	$24,905	$37,450	$24,323	$166,866	$81,174
All other fuel	$8,651	$570	$1,368	$2,549	$212	$2,800	$1,152
Lumber, casks, barrels, boxes, and nails	$727,663	$257,905	$11,340	$14,546	$33,227	$378,557	$32,088
Cartons, wrapping paper, straw, and hay	$43,897	$13,252	$785	$876	$1,247	$23,890	$3,847
Supplies used in repairs on tanks and furnaces	$247,538	$72,010	$2,650	$2,531	$7,666	$152,213	$10,468
Mill supplies	$65,616	$37,290	$240	$550	$1,460	$24,315	$1,761
All other materials	$296,155	$56,922	$4,788	$9,417	$4,995	$184,680	$35,353
Freight	$234,855	$41,299	$9,379	$8,293	$9,735	$154,205	$11,944
Products:[2]							
Total value	$17,096,234	$5,711,948	$274,011	$346,790	$671,422	$9,213,545	$878,518
Building glass—							
Window, 50-foot boxes	4,341,282	1,701,729	124,541	89,522	200,854	2,068,340	156,296
Value	$10,879,355	$4,176,587	$267,611	$243,085	$519,187	$5,301,131	$371,754
Plate—							
Total cast, square feet	34,758,994	8,553,838	......	......	......	19,546,674	6,658,482
Rough sold, square feet	628,684	31,917	......	......	......	579,905	16,862
Value	$75,887	$4,780	......	......	......	$68,032	$3,075
Polished plate made, square feet	16,883,578	5,177,160	......	......	......	10,877,250	829,168
Value	$5,158,598	$1,415,224	......	......	......	$3,441,734	$301,640
Cathedral, square feet	8,846,361	......	......	......	......	......	8,846,361
Value	$567,252	......	......	......	......	......	$567,252
Skylight, square feet	3,679,694	......	......	......	......	3,636,536	43,158
Value	$165,086	......	......	......	......	$161,203	$3,883
Wire, square feet	1,295,504	......	......	......	......	1,295,504	......
Value	$129,051	......	......	......	......	$129,051	......
Value of all other products	$121,005	$15,000	$6,400	$57,011	......	$41,394	$1,200
Comparison of products:							
Number of establishments reporting for both years	59	20	3	5	5	20	6
Value for census year	$9,574,171	$3,088,863	$204,011	$251,714	$478,017	$4,790,490	$761,076
Value for preceding business year	$9,668,452	$2,908,757	$215,388	$177,837	$368,431	$4,949,146	$1,048,893
Equipment and characteristics of works:							
Pot furnaces—							
Operated, number	164	77	3	8	9	52	15
Pots, number	1,825	735	24	60	82	780	144
Idle, number	29	5	......	1	4	14	5
Pots, number	471	90	......	5	80	234	62
Tanks—							
Continuous—							
Operated, number	34	12	3	......	2	16	1
Rings, number	433	179	24	......	22	205	3
Pot capacity, number	1,299	537	72	......	66	615	9
Intermittent, or day—							
Operated, number	13	1	......	......	......	12	......
Tons capacity, number	124	15	......	......	......	109	......
Pot capacity, number	124	15	......	......	......	109	......
Idle, number	1	......	......	......	......	1	......
Tons capacity, number	7	......	......	......	......	7	......
Pot capacity, number	7	......	......	......	......	7	......
Flattening ovens, number	285	116	6	5	12	138	8
Monkey ovens, number	2	......	......	......	......	......	2
Blow furnaces, number	259	135	......	10	15	94	5
Casting tables, number	100	17	......	5	3	57	18
Annealing ovens, number	869	258	......	5	23	485	98
Bending ovens, number	9	5	......	......	......	4	......
Lehrs, number	302	115	5	12	13	147	10
Clay-grinding mills, number	63	22	3	6	3	23	6
Grinding machines, number	227	61	......	3	12	129	22
Polishing machines, number	294	86	......	......	10	174	24
Sand-blast machines, number	5	1	......	1	......	3	......
Mechanical stokers, number	62	......	......	2	8	52	......
Horses and mules, number	92	14	6	5	3	47	17
Wagons, carts, and drays, number	93	13	7	3	2	52	16
Power:							
Number of establishments reporting	111	45	4	7	6	41	8
Total horsepower	43,939	8,741	90	155	5,799	25,516	3,638
Owned—							
Engines—							
Steam, number	442	127	4	8	8	274	21
Horsepower	37,161	8,230	90	155	2,250	23,292	3,144
Gas or gasoline, number	25	7	......	......	3	15	......
Horsepower	685	143	......	......	29	513	......

[1] Includes establishments distributed as follows: Illinois, 1; Maryland, 2; Massachusetts, 1; Missouri, 2; West Virginia, 2; Delaware, 1.

[2] While the aggregate value for the respective states is the aggregate value of products reported for building glass manufacture, this total can not be obtained by adding the amounts given, as the report of certain products has been suppressed to avoid disclosing the operations of individual establishments.

TABLE 13.—BUILDING GLASS, BY STATES: 1900—Continued.

	United States.	Indiana.	New Jersey.	New York.	Ohio.	Pennsylvania.	All other states.[1]
Power—Continued.							
Total horsepower—Continued.							
Owned—Continued.							
Water wheels, number	1	...	...	...	...	...	1
Horsepower	12	...	...	...	...	...	12
Electric motors, number	134	14	...	...	39	66	15
Horsepower	5,628	368	...	...	3,520	1,258	182
Other power, number	6	...	...	...	...	6	...
Horsepower	410	...	...	...	...	410	...
Rented—							
Electric, horsepower	1	...	...	...	...	1	...
Other, horsepower	12	...	...	...	...	12	...
Establishments classified by number of persons employed, not including proprietors and firm members:							
Total number of establishments	124	51	4	7	7	46	9
5 to 20	3	2	...	...	...	...	1
21 to 50	16	4	1	5	2	2	2
51 to 100	43	24	1	2	...	12	4
101 to 250	41	15	2	...	4	19	1
251 to 500	13	4	...	...	1	7	1
501 to 1,000	8	2	...	...	...	6	...

[1] Includes establishments distributed as follows: Illinois, 1; Maryland, 2; Massachusetts, 1; Missouri, 2; West Virginia, 2; Delaware, 1.

TABLE 14.—PRESSED AND BLOWN GLASS AND BOTTLES AND JARS, BY STATES: 1900.

	United States.	Illinois.	Indiana.	Maryland.	Massachusetts.	New Jersey.	New York.	Ohio.	Pennsylvania.	West Virginia.	All other states.[1]
Number of establishments	231	5	59	5	4	22	20	21	73	14	8
Character of organization:											
Individual	23	...	5	...	...	3	3	1	10	1	...
Firm and limited partnership	49	...	6	1	1	3	4	4	24	3	3
Incorporated company	157	5	47	4	3	16	12	16	39	10	5
Miscellaneous	2	...	1	...	...	...	1	...	...	...	...
Capital:											
Total	$34,806,781	$2,143,658	$5,694,974	$479,534	$255,949	$5,178,672	$1,908,799	$3,412,379	$13,626,067	$1,265,624	$841,125
Land	$2,600,798	$65,157	$240,812	$32,061	$33,000	$302,136	$226,225	$228,181	$1,314,384	$72,042	$86,800
Buildings	$7,933,493	$520,764	$1,321,693	$104,365	$50,047	$1,083,071	$325,504	$823,928	$3,190,620	$348,301	$165,200
Machinery, tools, and implements	$4,723,745	$108,289	$774,210	$61,495	$34,150	$339,100	$262,082	$500,422	$2,257,465	$230,532	$156,000
Cash and sundries	$19,548,745	$1,449,448	$3,358,259	$281,613	$138,752	$3,454,365	$1,094,988	$1,859,848	$6,863,598	$614,749	$433,125
Proprietors and firm members	145	...	22	2	2	14	11	7	73	6	8
Salaried officials, clerks, etc.:											
Total number	1,653	71	285	28	38	309	106	174	535	80	27
Total salaries	$1,980,393	$106,600	$375,122	$36,576	$27,660	$278,634	$124,538	$226,459	$675,368	$93,016	$36,420
Officers of corporations—											
Number	302	12	87	6	7	50	27	25	66	17	5
Salaries	$625,163	$36,260	$165,249	$9,710	$9,469	$82,340	$51,354	$60,814	$172,367	$27,900	$9,700
General superintendents, managers, clerks, etc.—											
Total number	1,351	59	198	22	31	259	79	149	469	63	22
Total salaries	$1,355,230	$70,340	$209,873	$26,866	$18,191	$196,294	$73,184	$165,645	$503,001	$65,116	$26,720
Men—											
Number	1,162	56	164	20	22	228	73	121	406	50	22
Salaries	$1,268,971	$68,320	$193,189	$25,544	$15,326	$183,770	$69,986	$153,593	$473,401	$59,122	$26,720
Women—											
Number	189	3	34	2	9	31	6	28	63	13	...
Salaries	$86,259	$2,020	$16,684	$1,322	$2,865	$12,524	$3,198	$12,052	$29,600	$5,994	...
Wage-earners, including pieceworkers, and total wages:											
Greatest number employed at any one time during the year	52,370	3,889	12,011	870	486	7,032	6,186	5,212	16,012	2,266	1,406
Least number employed at any one time during the year	37,601	3,639	9,150	631	327	4,395	2,110	3,395	10,775	1,891	1,288
Average number	40,916	3,291	9,103	657	375	5,153	2,328	4,069	12,961	1,886	1,093
Total wages	$18,055,037	$1,615,786	$3,974,228	$275,354	$179,329	$2,299,500	$1,140,973	$1,691,378	$5,580,771	$734,676	$563,042
Men, 16 years and over—											
Average number	30,372	2,594	7,002	477	331	4,136	1,975	3,028	8,768	1,258	803
Wages	$15,901,620	$1,491,391	$3,557,923	$249,756	$169,891	$2,115,061	$1,075,992	$1,468,952	$4,658,460	$603,817	$510,377
Women, 16 years and over—											
Average number	3,509	148	634	54	19	170	73	405	1,526	468	12
Wages	$835,100	$28,456	$129,808	$8,673	$4,392	$32,726	$17,831	$96,017	$409,349	$103,748	$4,100
Children, under 16 years—											
Average number	7,035	549	1,467	126	25	847	280	636	2,667	160	278
Wages	$1,318,317	$95,939	$286,497	$16,925	$5,046	$151,713	$47,150	$126,409	$512,962	$27,111	$48,565
Average number of wage-earners, including pieceworkers, employed during each month:											
Men, 16 years and over—											
January	34,589	3,008	8,091	516	343	4,987	2,191	3,345	9,840	1,302	966
February	34,811	3,005	8,128	528	368	5,027	2,100	3,389	9,943	1,357	966
March	35,403	3,000	8,386	579	330	5,053	2,302	3,533	9,858	1,362	1,000
April	35,057	2,980	8,560	593	303	4,475	2,428	3,576	9,799	1,357	986
May	33,510	2,939	7,922	590	323	4,630	2,387	3,358	9,169	1,309	883
June	31,439	2,791	7,317	588	310	4,392	2,257	3,240	8,637	1,095	812
July	12,245	657	2,363	164	222	1,382	909	1,205	4,631	507	205
August	14,751	660	2,638	196	239	916	988	1,622	6,043	1,211	205
September	29,484	3,025	6,243	457	344	3,913	1,672	3,070	8,555	1,377	828
October	33,300	3,020	7,859	504	373	4,660	1,959	3,302	9,416	1,381	826
November	34,801	3,036	8,256	495	403	5,076	2,205	3,312	9,641	1,397	950
December	35,080	3,003	8,267	514	417	5,092	2,296	3,383	9,687	1,437	984
Women, 16 years and over—											
January	3,795	179	792	53	15	153	71	431	1,640	448	13
February	3,855	177	758	58	19	159	67	439	1,707	458	13
March	3,957	177	810	62	19	166	83	487	1,677	463	13
April	3,868	177	806	57	20	160	90	479	1,603	463	13

[1] Includes establishments distributed as follows: California, 1; Colorado, 1; Georgia, 1; Michigan, 1; Missouri, 1; Virginia, 2; Wisconsin, 1.

TABLE 14.—PRESSED AND BLOWN GLASS AND BOTTLES AND JARS, BY STATES: 1900—Continued.

	United States.	Illinois.	Indiana.	Maryland.	Massachusetts.	New Jersey.	New York.	Ohio.	Pennsylvania.	West Virginia.	All other states.[1]
Average number of wage-earners, including pieceworkers, employed during each month—Continued.											
Women, 16 years and over—Con.											
May	3,468	167	625	58	20	181	93	427	1,451	433	13
June	3,325	152	623	54	18	182	84	402	1,366	428	16
July	1,837	24	197	25	8	147	44	193	1,007	176	16
August	2,515	24	253	50	14	93	60	251	1,247	508	15
September	3,411	172	442	59	21	135	56	414	1,555	557	....
October	3,886	171	715	61	20	175	67	447	1,673	557	....
November	4,117	177	801	61	24	261	80	451	1,681	565	16
December	4,072	177	782	56	24	223	79	445	1,709	561	16
Children, under 16 years—											
January	8,210	667	1,810	132	34	996	298	829	2,958	156	330
February	8,369	659	1,873	136	35	993	284	840	3,056	163	330
March	8,446	659	1,880	188	24	983	298	832	3,061	172	349
April	8,551	661	1,906	197	24	965	332	819	3,128	172	347
May	7,249	646	1,301	186	25	986	348	549	2,674	167	367
June	6,991	646	1,190	199	25	963	331	585	2,590	165	297
July	2,321	....	520	5	6	169	116	82	1,261	77	85
August	3,270	....	690	5	6	157	139	246	1,803	139	85
September	6,088	650	1,097	60	24	789	237	464	2,341	182	244
October	8,029	660	1,745	137	30	969	290	789	2,985	180	244
November	8,427	671	1,799	128	32	1,124	327	797	3,043	177	329
December	8,467	667	1,796	136	35	1,071	364	796	3,098	173	331
Miscellaneous expenses:											
Total	$2,222,776	$210,329	$341,500	$22,313	$13,483	$229,514	$130,936	$136,007	$1,000,711	$109,904	$28,079
Rent of works	$22,881	....	$780	....	....	$683	$7,745	$68	$8,005	$400	$5,200
Taxes, not including internal revenue	$131,369	$9,426	$27,163	$1,480	$2,915	$20,822	$7,312	$14,969	$38,849	$4,622	$3,811
Rent of offices, insurance, interest, and all sundry expenses not hitherto included	$2,020,692	$200,903	$309,557	$20,833	$10,568	$201,600	$103,487	$120,970	$933,174	$102,932	$16,668
Contract work	$47,834	....	$4,000	....	....	$6,409	$12,392	....	$20,683	$1,950	$2,400
Materials used:											
Aggregate cost	$12,051,925	$664,858	$3,262,466	$120,759	$130,095	$1,401,980	$778,842	$1,094,638	$3,738,422	$557,368	$302,497
Glass sand, tons	403,754	32,778	119,621	2,076	1,322	78,497	19,843	31,856	96,683	9,205	11,873
Cost	$547,943	$33,231	$139,056	$3,929	$6,265	$75,688	$42,344	$59,199	$157,462	$12,958	$17,811
Soda ash (carbonate of soda), tons	132,279	11,942	40,592	1,263	189	20,015	7,449	10,406	33,192	2,796	4,435
Cost	$1,921,405	$163,694	$579,638	$19,080	$5,217	$299,245	$112,153	$147,128	$471,130	$42,751	$81,369
Salt cake (sulphate of soda), tons	468	....	213	....	....	197	....	....	58	....	....
Cost	$5,755	....	$3,214	....	....	$1,778	....	....	$763	....	....
Nitrate of soda, tons	10,156	440	2,279	149	24	1,314	525	1,259	3,789	307	70
Cost	$311,675	$13,720	$73,368	$5,000	$830	$21,165	$18,118	$39,634	$126,058	$10,982	$2,800
Limestone, tons	30,741	4,815	9,082	118	....	8,227	1,545	1,374	3,399	325	1,856
Cost	$75,177	$9,912	$15,895	$319	....	$24,621	$5,205	$3,434	$8,730	$575	$6,486
Lime, hundredweights	669,649	45,387	218,088	14,725	559	126,001	32,819	72,488	127,790	11,228	20,564
Cost	$135,586	$10,175	$35,854	$1,233	$112	$24,500	$8,885	$14,230	$34,027	$2,820	$3,750
Arsenic, pounds	1,028,131	45,207	319,648	1,650	6,789	97,405	61,018	123,344	285,267	69,303	18,500
Cost	$49,563	$2,153	$14,981	$83	$330	$4,632	$2,876	$6,876	$13,372	$3,295	$965
Carbon, tons	182	90	36	....	....	20	4	....	14	12	6
Cost	$2,501	$1,018	$422	....	....	$406	$234	....	$201	$150	$78
Manganese, pounds	1,424,938	58,838	508,980	11,167	8,101	143,465	89,521	76,117	437,181	58,944	32,624
Cost	$55,177	$1,910	$18,920	$566	$207	$5,674	$3,737	$3,672	$16,831	$2,239	$1,421
Litharge (red lead), pounds	8,350,585	115,000	1,481,887	36,982	364,448	72,049	790,909	2,063,000	3,141,027	285,283	....
Cost	$487,927	$6,200	$76,155	$1,857	$24,497	$3,918	$46,114	$117,035	$191,568	$20,583	....
Potash or pearlash, pounds	4,335,828	....	443,481	75,000	207,967	60,270	414,438	850,171	1,932,699	351,802	....
Cost	$183,143	....	$18,054	$3,000	$8,994	$2,866	$17,552	$34,129	$81,991	$16,557	....
Grinding sand, tons	1,505	....	299	....	....	433	50	97	580	46	....
Cost	$5,735	....	$722	....	....	$519	$120	$480	$3,629	$265	....
Rouge, pounds	1,787	....	....	....	....	1,300	....	87	....	400	....
Cost	$299	....	....	....	....	$41	....	$174	....	$84	....
Plaster of Paris, tons	86	....	34	....	....	....	10	11	27	4	....
Cost	$1,097	....	$494	....	....	....	$71	$111	$364	$57	....
Fire clay or pot clay, pounds	8,640,317	562,000	1,342,070	141,300	26,158	1,912,005	744,450	946,000	2,560,394	134,940	271,000
Cost	$50,661	$4,960	$7,084	$717	$120	$11,727	$5,935	$2,306	$15,990	$1,437	$385
Pots, not including those made at works, number	5,111	284	947	164	110	301	143	863	2,095	184	20
Cost	$280,086	$16,930	$56,849	$7,286	$5,175	$11,217	$7,125	$52,861	$110,124	$11,199	$1,320
Fuel—											
Total cost	$2,084,124	$154,020	$159,924	$33,416	$30,287	$415,485	$184,417	$213,633	$711,295	$77,423	$104,224
Natural gas	$823,924	....	$157,963	....	....	....	$9,190	$99,404	$481,833	$75,534	....
Oil, gallons	11,967,202	1,663,301	135	148,396	371,867	4,964,767	1,293,521	1,250,637	938,873	18,650	1,317,055
Cost	$385,997	$41,084	$37	$6,234	$15,619	$155,257	$45,603	$31,874	$44,548	$585	$45,156
Coal, tons	485,852	113,475	520	12,315	3,416	92,520	48,190	48,816	139,116	1,271	26,213
Cost	$738,218	$94,232	$1,478	$22,089	$12,782	$194,457	$121,302	$78,138	$159,503	$1,304	$52,933
All other fuel	$135,985	$18,704	$446	$5,093	$1,886	$65,771	$8,322	$4,217	$25,411	....	$6,135
Rent of power and heat	$62	....	....	....	....	....	....	....	$62	....	....
Lumber, casks, barrels, boxes, and nails	$2,050,362	$103,089	$683,929	$12,239	$11,851	$182,510	$113,281	$178,424	$647,956	$100,424	$16,659
Cartons, wrapping paper, straw, and hay	$568,705	$22,571	$277,273	$2,326	$4,193	$21,605	$21,429	$48,523	$137,122	$32,513	$1,150
Caps, metal trimmings, and rubber supplies	$1,522,917	$31,073	$747,574	$10,494	$6,816	$79,359	$67,111	$61,212	$405,045	$101,983	$12,250
Supplies used in repairs on tanks or furnaces	$284,378	$35,559	$73,657	$2,107	$2,723	$44,439	$27,993	$11,508	$53,452	$16,140	$16,800
Mill supplies	$72,818	$1,076	$19,556	$2,486	$687	$3,467	$2,978	$7,604	$24,854	$8,680	$1,430
All other materials	$695,596	$30,672	$80,211	$8,444	$20,679	$104,547	$69,533	$38,751	$273,827	$63,625	$5,307
Freight	$659,233	$22,895	$179,636	$6,177	$1,112	$62,571	$21,631	$53,714	$252,569	$30,628	$28,300
Products:											
Aggregate value	$39,443,478	$2,810,398	$9,045,935	$454,633	$402,258	$4,819,811	$2,410,188	$3,875,661	$12,797,585	$1,770,553	$1,056,456
Pressed and blown glass—											
Total value	$17,076,125	$131,618	$2,691,787	$100,000	$382,091	$21,300	$1,173,784	$2,738,289	$8,453,550	$1,379,706	$4,000
Tableware, 100 pieces	655,141	....	126,162	....	....	....	....	150,992	364,770	13,217	....
Value	$2,617,784	....	$291,060	....	....	....	....	$668,469	$1,585,870	$72,385	....
Jellies, tumblers, and goblets, dozens	8,544,050	....	3,050,595	340,000	....	....	....	1,681,584	3,112,588	359,283	....
Value	$2,007,386	....	$630,485	$100,000	....	....	....	$392,612	$793,902	$90,387	....
Lamps, dozens	807,765	....	81,972	....	2,020	....	15,599	191,084	455,543	61,547	....
Value	$1,498,675	....	$43,116	....	$4,000	....	$7,447	$185,297	$983,452	$275,363	....
Chimneys, dozens	6,901,192	173,931	3,113,228	....	84,000	....	186 800	1,508,114	1,835,119	....	....
Value	$2,719,583	$131,618	$1,196,996	....	$33,000	....	$96,707	$622,721	$638,541	....	....
Lantern globes, dozens	1,044,816	....	547,971	....	2,000	....	162,038	142,800	58,275	131,732	....
Value	$497,021	....	$176,150	....	$1,800	....	$189,629	$69,589	$26,920	$32,933	....

[1] Includes establishments distributed as follows: California, 1; Colorado, 1; Georgia, 1; Michigan, 1; Missouri, 1; Virginia, 2; Wisconsin, 1.

TABLE 14.—PRESSED AND BLOWN GLASS AND BOTTLES AND JARS, BY STATES: 1900—Continued.

	United States.	Illinois.	Indiana.	Maryland.	Massachusetts.	New Jersey.	New York.	Ohio.	Pennsylvania.	West Virginia.	All other states.[1]
Products—Continued.											
Pressed and blown glass—Con.											
Shades, globes, and gas and electric goods, dozens	2,673,854	...	15,052	...	23,300	41,666	312,500	1,397,824	856,125	27,387	...
Value	$2,497,885	...	$19,044	...	$10,000	$6,500	$520,000	$398,420	$1,152,248	$61,673	...
Blown tumblers, stemware, and bar goods, dozens	6,127,367	...	112,163	...	...	...	...	214,072	3,512,552	2,288,580	...
Value	$1,598,652	...	$37,701	...	...	...	...	$53,368	$1,107,489	$400,091	...
Opal ware, dozens	3,750,443	...	244,873	...	3,000	...	1,000	96,597	2,925,545	479,428	...
Value	$1,581,731	...	$90,322	...	$4,000	...	$1,500	$51,656	$1,214,472	$219,781	...
Cut glass, dozens	134,726	...	325	...	3,332	...	...	2,900	56,800	71,369	...
Value	$672,463	...	$600	...	$146,613	...	...	$126,000	$311,189	$88,061	...
All other products for this group	$1,384,945	...	$206,313	...	$152,678	$14,800	$358,501	$170,157	$339,467	$139,029	$4,000
Bottles and jars—											
Total value	$21,676,791	$2,678,780	$6,327,468	$346,633	$20,167	$4,452,219	$1,195,276	$1,058,955	$1,162,990	$381,847	$1,052,456
Prescription vials, and druggists' ware, gross	2,423,932	265,918	624,128	20,000	...	731,107	81,803	76,409	551,236	4,004	69,327
Value	$4,665,697	$404,799	$1,184,397	$94,633	...	$1,306,316	$203,734	$155,377	$1,170,061	$8,889	$137,491
Beers, sodas, and minerals, gross	1,351,118	406,037	109,194	13,004	128	108,247	134,364	219,422	147,145	25,000	188,577
Value	$5,075,068	$1,332,842	$347,836	$120,212	$626	$408,661	$195,398	$637,428	$901,129	$92,000	$738,936
Liquors and flasks, gross	985,374	31,168	604,798	5,000	6,298	64,140	44,171	16,400	142,518	43,058	27,823
Value	$2,403,447	$131,869	$1,207,519	$20,000	$19,511	$153,165	$110,221	$57,350	$448,182	$169,852	$85,748
Milk jars, gross	146,142	7,500	19,561	...	...	19,798	6,938	6,000	80,485	4,600	1,260
Value	$729,008	$37,500	$55,344	...	...	$107,431	$33,863	$30,000	$434,310	$23,000	$7,560
Fruit jars, gross	789,298	1,500	559,549	...	...	61,871	31,235	2,000	115,000	14,643	3,500
Value	$2,935,036	$9,000	$2,106,250	...	...	$192,467	$128,965	$8,000	$136,104	$43,750	$10,500
Patent and proprietary, gross	1,296,131	302,708	244,343	500	...	601,276	57,224	20,000	55,080	...	15,000
Value	$2,602,976	$495,597	$378,301	$1,500	...	$1,399,042	$120,543	$35,800	$142,193	...	$30,000
Packers and preservers', gross	784,588	80,739	247,731	5,007	...	278,960	11,430	25,000	113,546	10,242	11,933
Value	$2,119,221	$195,691	$686,092	$15,021	...	$620,869	$33,706	$100,000	$419,947	$20,356	$27,539
Demijohns and carboys, dozens	83,243	29,136	...	...	...	18,689	10,929	...	17,815	...	6,674
Value	$206,061	$48,984	...	...	...	$86,645	$18,896	...	$36,854	...	$14,682
All other products for this group	$940,277	$22,498	$361,729	$95,267	...	$177,623	$49,950	$35,000	$174,210	$24,000	...
Value of all other products	$690,562	...	$26,680	$8,000	...	$346,292	$41,128	$78,417	$181,045	$9,000	...
Comparison of products:											
Number of establishments reporting for both years	193	5	43	5	3	20	18	16	68	10	5
Value for census year	$37,610,478	$2,810,398	$8,069,031	$454,633	$382,091	$1,723,436	$2,387,188	$3,660,133	$12,557,359	$1,628,027	$938,182
Value for preceding business year	$32,291,216	$2,278,679	$7,147,396	$430,845	$430,549	$4,324,575	$2.172,657	$2,948,234	$10,434,929	$1,371,352	$752,000
Equipment and characteristics of works:											
Pot furnaces—											
Operated, number	227	8	39	6	3	24	16	28	91	11	1
Pots, number	2,475	105	485	67	28	176	140	362	978	122	12
Idle, number	31	1	4	1	2	6	4	1	11	1	...
Pots, number	336	12	44	12	19	55	42	15	125	12	...
Tanks—											
Continuous—											
Operated, number	158	11	59	...	...	28	14	10	27	...	9
Rings, number	1,238	133	385	...	...	269	115	73	199	...	64
Pot capacity, number	2,476	266	770	...	...	538	230	146	398	...	128
Idle, number	14	...	4	...	...	6	...	...	1	...	3
Rings, number	79	...	12	...	...	40	...	...	8	...	19
Pot capacity, number	158	...	24	...	...	80	...	...	16	...	38
Intermittent or day—											
Operated, number	117	7	32	1	1	12	7	3	32	19	3
Tons capacity, number	694	40	193	6	90	72	49	13	123	85	23
Pot capacity, number	694	40	193	6	90	72	49	13	123	85	23
Idle, number	16	...	4	...	...	2	1	3	4	1	1
Tons capacity, number	76	...	12	...	...	7	3	12	35	5	2
Pot capacity, number	76	...	12	...	...	7	3	12	35	5	2
Shops, number	3,978	427	1,397	67	38	718	312	613	144	158	104
Glory holes, number	1,419	146	351	24	16	301	66	93	351	28	43
Annealing ovens, number	1,540	289	161	21	15	266	126	121	395	18	128
Lehrs, number	1,025	31	321	18	12	95	55	102	323	59	9
Decorating kilns, number	105	...	6	1	8	...	1	27	55	7	...
Decorating lehrs, number	23	...	1	...	...	...	...	4	15	3	...
Presses, hand, number	915	13	197	7	9	55	49	125	402	57	1
Presses, mechanical, number	49	...	4	...	...	...	...	...	42	3	...
Blowing machines, number	169	1	80	...	...	4	1	18	65	...	...
Finishing machines, number	140	2	33	...	...	1	2	59	42	1	...
Crimping machines, number	494	1	169	...	5	...	32	35	252	...	...
Mechanical polishers, number	16	...	...	...	1	1	1	1	12	...	...
Sand blast machines, number	68	1	8	...	3	1	9	10	27	9	...
Grinding machines for fruit jar tops, number	137	3	29	4	...	22	9	5	54	10	1
Clay grinding mills, number	8	...	1	...	...	1	...	2	4	...	...
Mechanical stokers, number	17	...	...	...	...	3	12	...	...	...	...
Horses and mules, number	317	23	7	8	7	92	41	15	87	5	29
Wagons, carts, and drays, number	314	24	20	11	8	104	44	6	74	5	18
Power:											
Number of establishments reporting	219	5	54	5	3	21	18	21	71	13	8
Total horsepower	14,990	675	2,645	207	187	1,666	972	1,527	5,440	952	719
Owned—											
Engines—											
Steam, number	311	13	60	7	4	65	25	30	79	16	12
Horsepower	12,630	675	2,103	197	100	1,591	862	1,176	4,440	767	719
Gas or gasoline, number	59	...	16	...	1	1	1	10	26	4	...
Horsepower	1,679	...	442	...	7	5	50	206	809	160	...
Water wheels, number	1	...	...	...	...	...	...	...	1	...	...
Horsepower	15	...	...	...	...	...	...	...	15	...	...
Electric motors, number	44	...	4	1	1	...	...	6	31	1	...
Horsepower	358	...	100	10	40	...	...	85	103	20	...
Other power, number	19	...	...	...	...	4	4	6	4	1	...
Horsepower	265	...	...	...	...	70	60	60	70	5	...
Rented—											
Electric, horsepower	43	...	...	...	40	...	...	...	3	...	...
Furnished to other establishments	10	...	...	...	...	...	10	...	...	...	...

[1] Includes establishments distributed as follows: California, 1; Colorado, 1; Georgia, 1; Michigan, 1; Missouri, 1; Virginia, 2; Wisconsin, 1.

TABLE 14.—PRESSED AND BLOWN GLASS AND BOTTLES AND JARS, BY STATES: 1900—Continued.

	United States.	Illinois.	Indiana.	Maryland.	Massachusetts.	New Jersey.	New York.	Ohio.	Pennsylvania.	West Virginia.	All other states.[1]
Establishments classified by number of persons employed, not including proprietors and firm members:											
Total number of establishments	231	5	59	5	4	22	20	21	73	14	8
Under 5	1									1	
5 to 20	2							1	1		
21 to 50	17		3			2	4		6	2	
51 to 100	50		15	1	2	1	5	3	12	4	4
101 to 250	98	1	28	3	2	9	7	8	36	3	1
251 to 500	45	2	10	1		3	4	7	11	1	3
501 to 1,000	13		2			3		2	6		
Over 1,000	5	2	1			1			1		

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[1] Includes establishments distributed as follows: California, 1; Colorado, 1: Georgia, 1; Michigan, 1; Missouri, 1; Virginia, 2; Wisconsin, 1.

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